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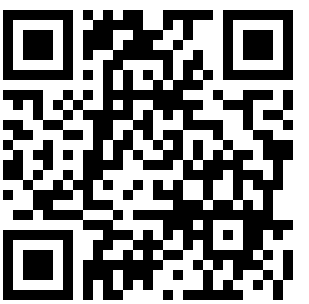

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ANNIVERSARY NUMBER

RADIO WORLD

Title Reg. U. S. Pat. Off.

ILLUSTRATED WEEKLY

15c. a Copy MARCH 31, 1923 $6.00 a Year

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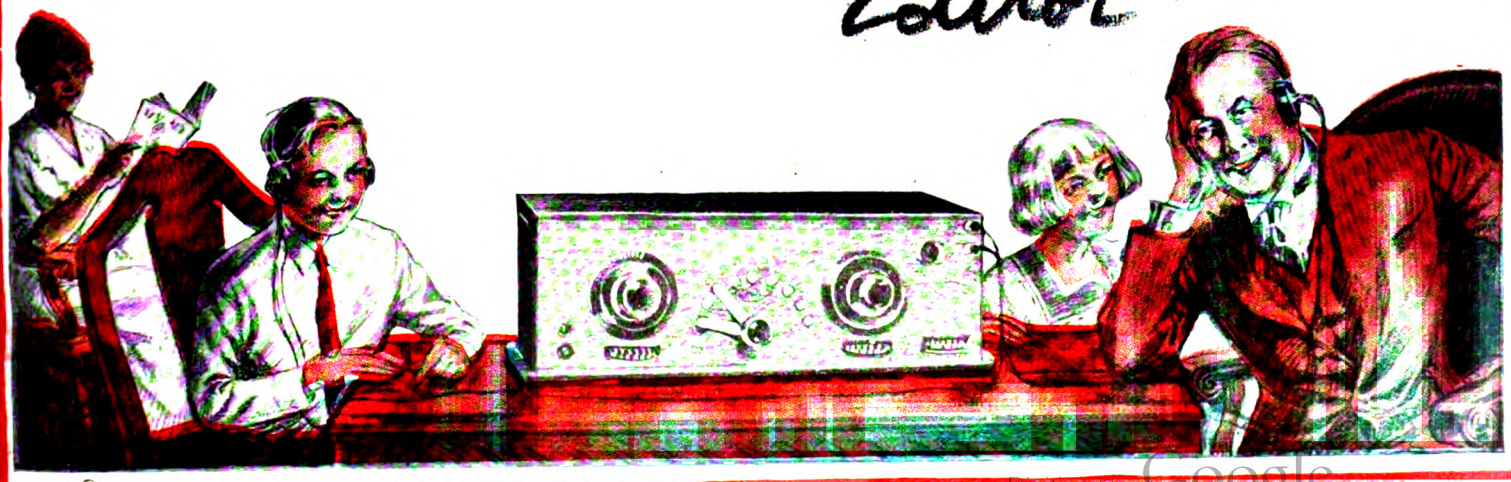

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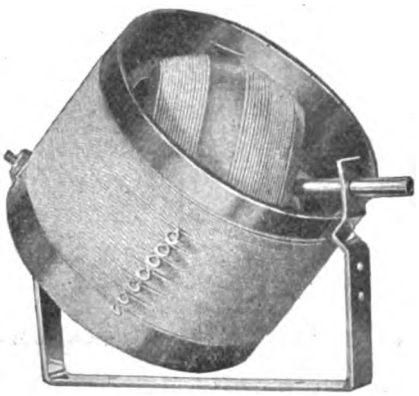

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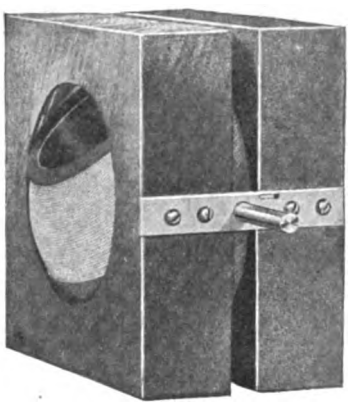

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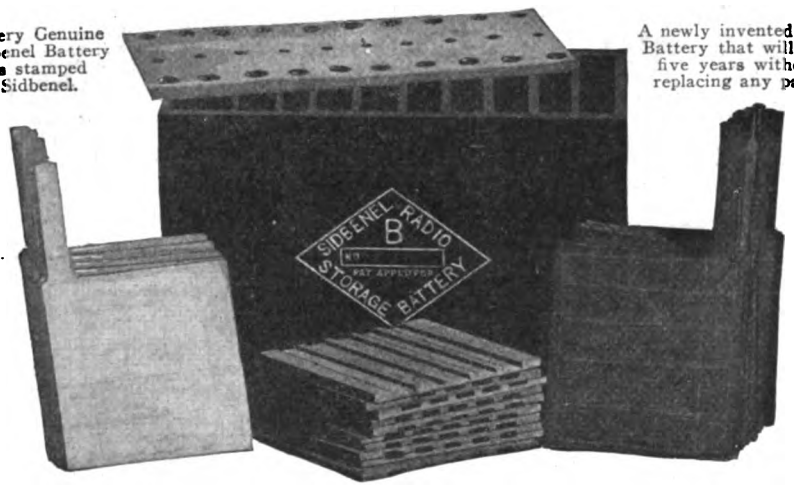

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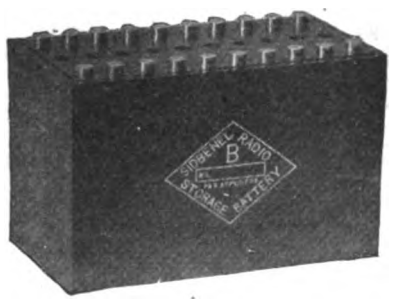

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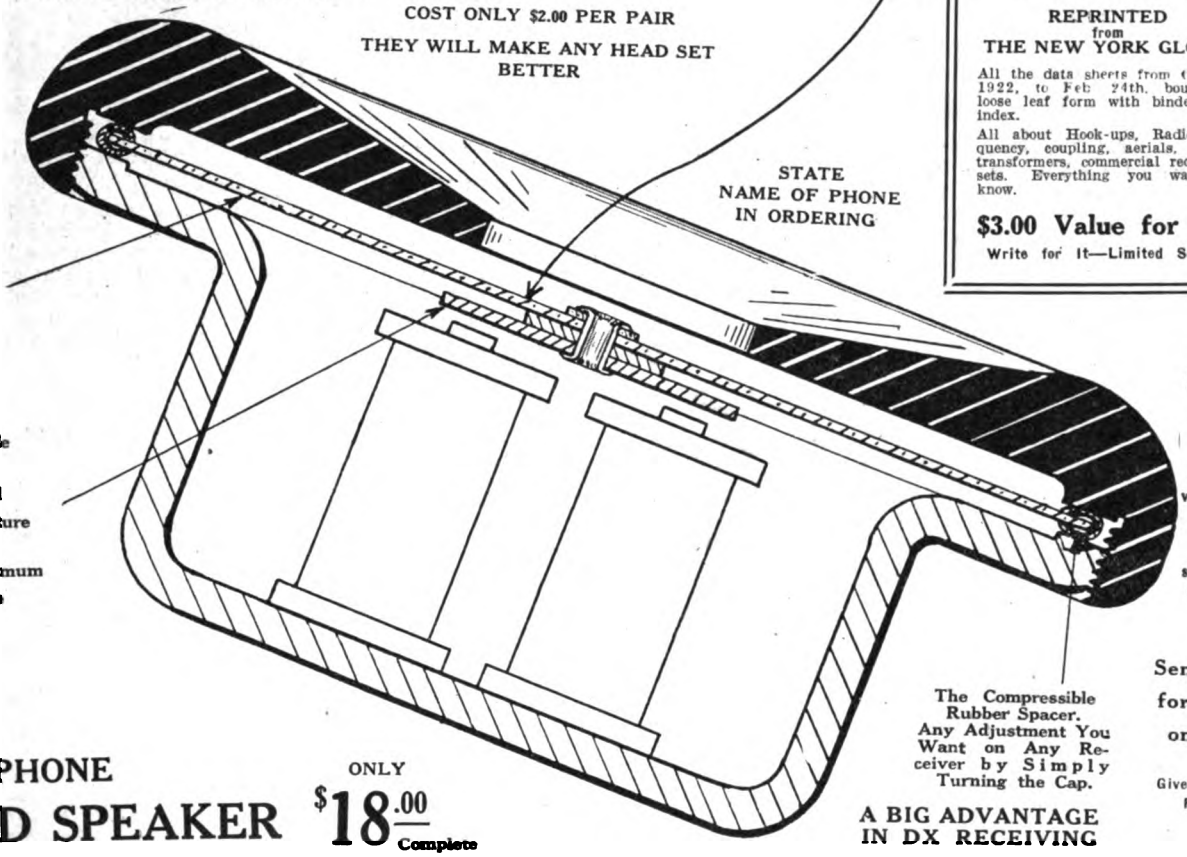

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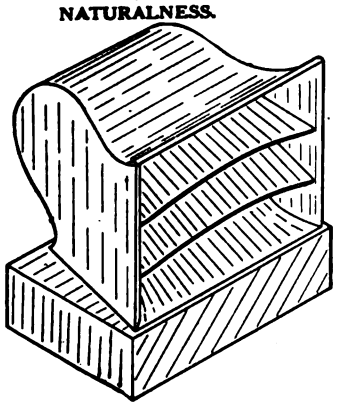

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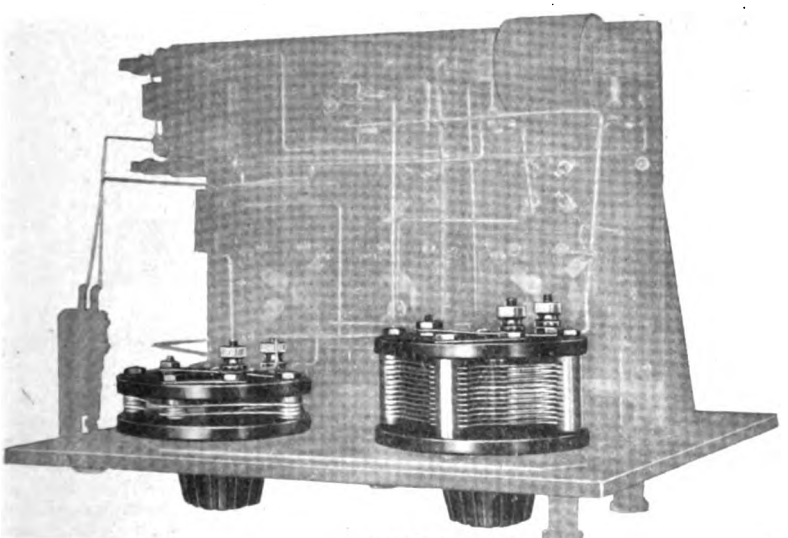

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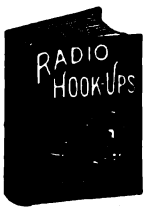

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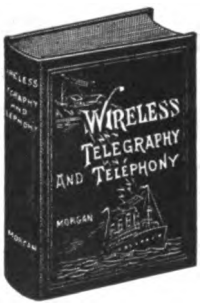

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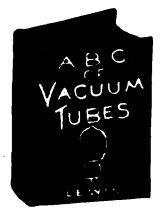

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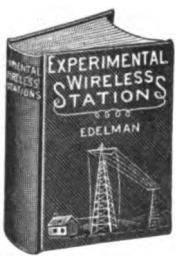

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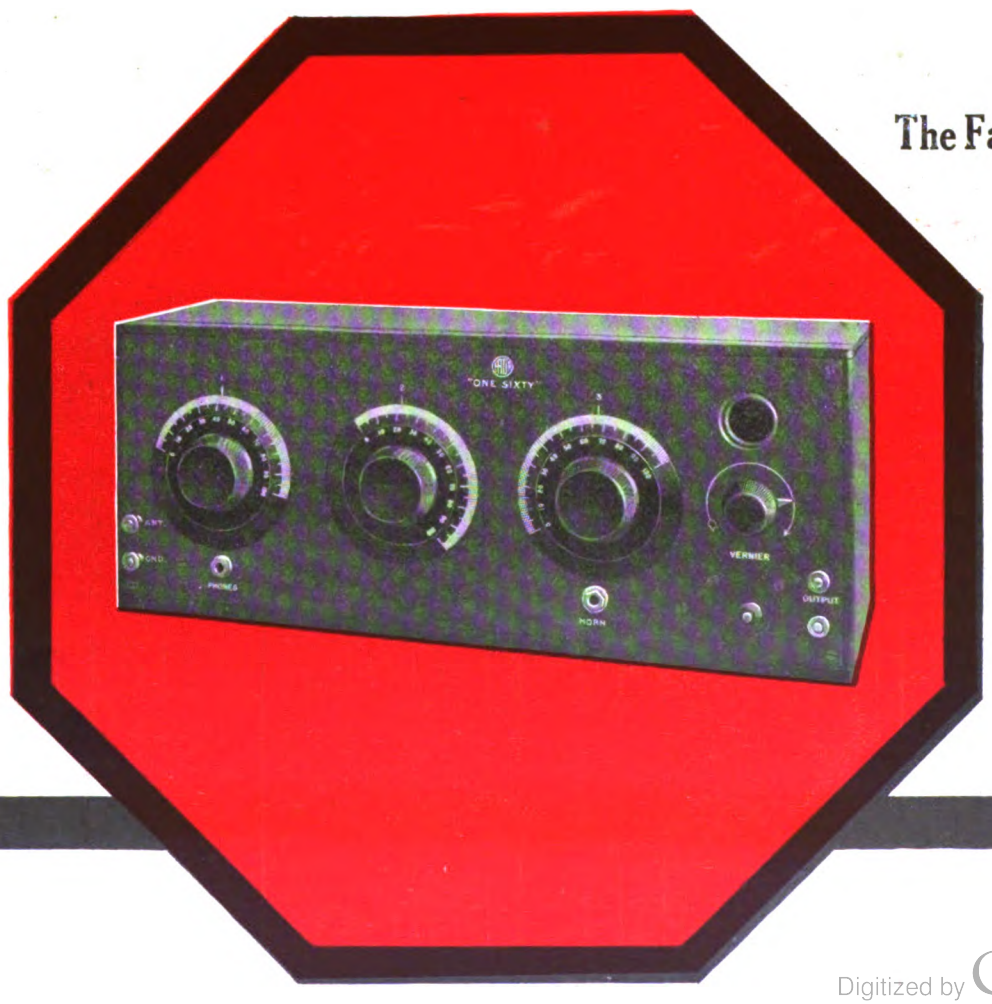

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

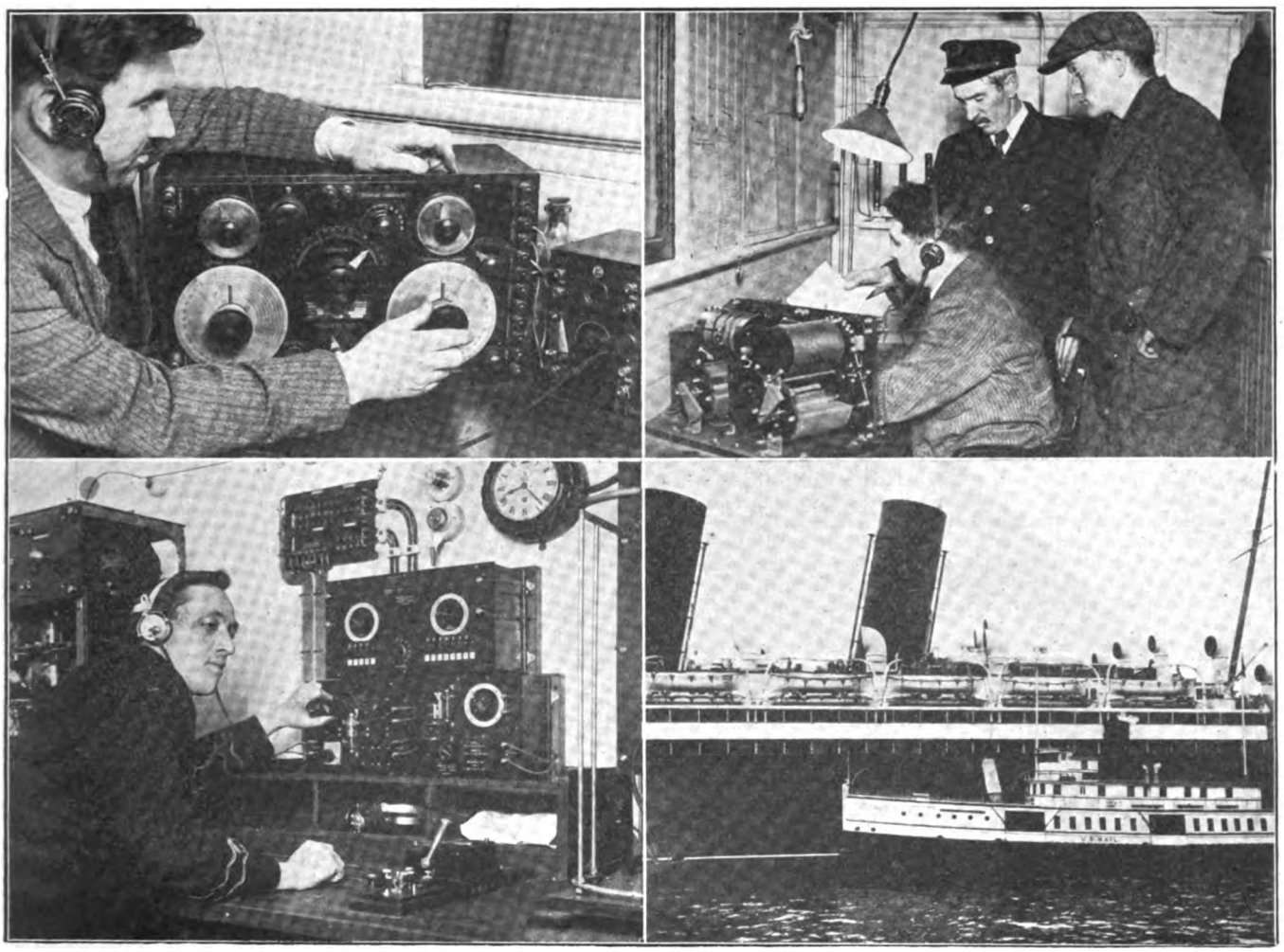
Vol. III, No. 1. Whole No. 53 | March 31, 1923 | 15c per copy, $6.00 a year

U. S. S. "President" First Radio Equipped Mail Boat in Service

By John Kent

The illustration below shows Operator M. G. Carter, with the new navy type regenerative receiver used on board the mail boat "President." It has a range of from 250 to 3,500 meters.

Captain A. Hillary, master, receiving information from the S.S. "Majestic" by means of radio. This picture also illustrates the interior of the receiver shown complete on the left.



(C. Kadel and Herbert)

The above illustration shows the powerful transmitter and receiver on board the S.S. "Majestic." First Operator F. Garwood informing the mail boat just how much mail to expect.

This picture shows mail being transferred from the S.S. "Majestic," one of the palaces of the sea, to the U. S. mail boat "President," one of the "mail carriers of the ocean lanes."

ALONG with the increase in imports and exports, there, of course, comes an increase in the amount of foreign mail arriving in this country. It is the custom of the mail boats to meet the large steamers down New York Bay to collect the mail so that everything will be facilitated and speed made possible.

The latest improvement to increase the efficiency in the handling of the mail, was equipping the U. S. Mail Boat "President" with an up-to-the-minute radio receiving set and powerful transmitter. Before the boat was equipped it was impossible to determine accurately just how many bags of mail the incoming liners had. But now, by means of radio, the mail boat is always in direct communication with the incoming boats and therefore can be informed how much mail is aboard.

This information is very valuable to the service, for otherwise the officials would not know how many men to send out to meet the incoming liner to help handle the ship's mail.

The radio installation made on the "President" is the latest type of apparatus used by the government. Competent and experienced operators are being trained to meet the demand when all the boats in the service are thus equipped, which will be in the near future.

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Letters of Congratulation to Radio World on Its Anniversary

FROM HON. THEODORE ROOSEVELT, ASSISTANT SECRETARY OF THE NAVY

I am pleased to learn that your publication, RADIO WORLD, has been favorably received, and trust that it will continue to meet with success.

The Navy Department is keenly interested in all movements to further the progress of radio, whether by education, by research, or by design, as it is firmly believed that the science of radio communication is an invaluable adjunct to national industrial progress as well as to the national defense.

FROM DR. A. E. KENNELLY, PROFESSOR OF ELECTRICAL ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

I am glad to hear that RADIO WORLD has come through its first year of public service in good health and doing well.

The subject of world communication calls for our best abilities in radio communication in addition to all that can be furnished by wire and cable. There is something marvelously fascinating about radio and its work that the public is always ready to listen to, if suitably presented, and it seems to me RADIO WORLD is undertaking a share of that task with satisfaction and success. I wish it continued and yet increasing success in the future.

FROM DR. LEE DE FOREST, WIRELESS PIONEER

I congratulate RADIO WORLD on the success which it has attained. It has done more than its share in arousing and keeping alive the ever-increasing popular interest in this magnificent new art of radio broadcast.

I wish RADIO WORLD and its staff continued and renewed success.

FROM DR. FRANK CRANE, EDITOR "CURRENT OPINION"

Radio has literally opened up a new world, and the possibilities that lie within it are staggering to the imagination. Every intelligent person must be interested in the progress made in this important field.

FROM JACK BINNS, RADIO EDITOR, "NEW YORK TRIBUNE"

When public interest was first attracted to radio there were many pessimists who said: "It is just a passing craze and will soon die out like other crazes have." These pessimists have already been refuted and radio has shown itself to be a public utility of very great importance, besides being a very interesting and entertaining means of amusement. The history of RADIO WORLD clearly proves this statement.

FROM GENERAL J. G. HARBORD, PRESIDENT RADIO CORPORATION OF AMERICA

It is a pleasure to pass on to you and to readers of RADIO WORLD a few remarks concerning some of my views on radio broadcasting.

Broadcasting appeals to the imagination as no other invention of the times. Its possibilities are beyond human comprehension. It is the romance and the inspiration of the world's splendid prime. No permanent record of the last act of "Il Trovatore," as given by the Chicago Grand Opera Company and actually heard in New York—no record, although equally perfect in its reproduction, is equal or comparable to hearing it by radio at the second it was rendered. One is history, the other action, timely and instantaneous.

The value of broadcasting to any individual or community will be in proportion to the difficulty of getting the same thing by any other means. Next to saving life at sea, radio's greatest service will be through the intelligent broadcasting of programs that will not only satisfy the desires of the average listener from an entertainment point of view, but will also be an interpreter of public tastes and opinions and of practical value in the furnishing of news, market reports, weather reports, time signals and religious services to people who live in remote districts.

Of one thing we are certain: Broadcasting is here to stay. But who is going to do it in the future and who is going to pay for it is a question which I cannot answer. But it seems to me that it must be organized and administered as a national service with the ideal, "the greatest good to the greatest number" as the watchword. If such a situation is brought about, it will, no doubt, be possible to devise some means to obtain compensation for the service either from manufacturers and distributors of radio apparatus, suitable contribution from listeners, or from the public-spirited endowment of a Carnegie or Rockefeller.

FROM REAR ADMIRAL W. A. MOFFETT, U. S. N., CHIEF BUREAU OF AERONAUTICS, UNITED STATES NAVY

My congratulations upon the success which RADIO WORLD has met, and I am truly pleased at this.

To naval aviation radio is one of our most important instruments for successful operation. Its use in communication between aircraft in flight, between aircraft and ship and between aircraft and shore has tremendously enhanced the value of aircraft in warfare. The development of aircraft radio and the development of the use of aircraft in fleet operations go hand in hand.

I wish RADIO WORLD every possible prosperity.

Radio on the Pacific

ALTHOUGH there are thirteen cables on the Atlantic, one cable only connects the United States with the Far East—that of the Pacific Commercial Company.

This cable has a limited capacity and is out of commission frequently for months at a time, due to the coral formation on the ocean's bottom between Guam and Manila. There has been some talk of another Pacific cable, but the physical conditions of the bottom are such that the laying of a second cable is a very expensive proposition. With the increasing facilities offered by radio, it is doubtful if the necessary money could be subscribed to finance such an undertaking, Naval experts believe.

The Navy has several radio circuits across the Pacific, the giant of which, both in length and volume of traffic, is that from San Francisco to Cavite in the Philippines. About one-third of all traffic goes clear across the Pacific and the other two-thirds is relayed at Honolulu or Guam, or both. There is a half-hourly schedule between San Francisco and Honolulu so that this service is practically continuous. Commercial traffic cannot be accepted at the San Francisco Naval station for Honolulu, although it is handled by points beyond Honolulu. Press traffic only is carried between San Francisco and Honolulu. Across the Pacific, Naval stations are located at Honolulu, Guam and Cavite and reaching to the southward, there is one at Tutuila, in the Samoan Islands. From Guam to Japan, messages are transmitted by cable, although there is no reason why radio could not be used if Japan would open its stations to such messages.

In Alaska, the principal Naval radio stations are at Sitka, Ketchikan, Seward, Kodiak, Cordova, Dutch Harbor and St. Paul. As the Alaska cable is often out of commission, this chain is frequently called upon to accept commercial messages for the northwest. The Naval radio station at Cavite is in communication with French Indo-China and the Dutch East Indies, and a commercial traffic agreement with the respective administrations exists. Northward from Cavite are the circuits to Peking and Shanghai.

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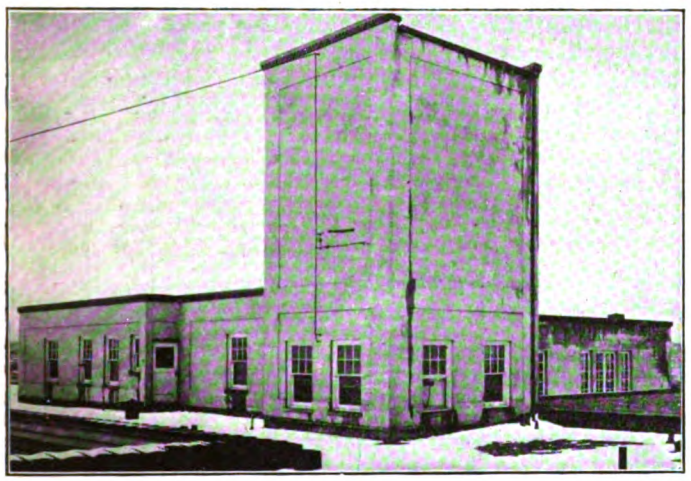
Newark Apartment Building First to Give Tenants Complete Radio Service

NEWARK, N. J., claims the distinction of being the first city in which apartment house owners give their tenants complete radio service.

This service, which in truth might be said to be the last word in modern improvements, is accomplished by means of an adaptation of the Western Electric Company's public address system installed in the pent house atop the Ritz Apartments at 299 Clinton avenue, Newark, N. J.

In any of the 72 suites a member of a family, by merely slipping on a headset and inserting a convenient plug, can comfortably sit in his or her home and listen to the country's best radio programs.

F. B. Kopff, the superintendent of the building, says the popularity of this innovation in apartment house service is evidenced by the fact that but comparatively little elevator service is required in the evenings; the greater number of the Ritz tenants prefer to stay in and listen in to radio programs.



(C. Western Electric Co.)
Pent house and radio room atop the Ritz Apartments, Newark, N. J., the first radio equipped apartment house on record.

The operator up in the radio room on the Ritz roof must needs combine diplomacy with ability when he selects and picks up from the air a program that will suit the preferences of all the people in the 72 apartments. But thus far he has been so successful in his selection that even a loud speaker could not make the complaints audible, for there have been none. However, should such a contingency ever occur, it will be readily taken care of by installing an additional radio receiving set.

The equipment now used gives adequate service. It consists of a radio receiving set and a high-power amplifier. There are four vacuum tubes in the receiver which provide a means of detection, two stages of radio frequency and a single stage of audio frenquency amplification. The complete set can be operated on dry batteries.

Because of the set's sensitiveness and selectivity every city in the country which has a 500-watt broadcasting station has been heard by the families living in the Ritz Apartments.

By means of a specially designed input coil, the radio receiver is connected to a Western Electric amplifier. Power type tubes provide three stages of audio frequency amplification, the last stage being push and pull. Incoming radio signals detected by the radio receiver are amplified and thence wired to all of the 72 apartments, each of which is equipped with a Western Electric headset of high impedance type and with a special receptacle. The telephone jacks used in these receptacles are so arranged that no matter whether a few or all 72 headsets be used, the quality and volume will be in no wise impaired.

The possibility that apartment houses which provide

(C. Western Electric Co.
David H. O'Brien, of the Western Electric Co., and William McNeery (The Man-in-the-Moon) in the radio room of the Ritz Apartments.

radio service may become as tumultuous as the Tower of Babel is easily averted. By using headsets rather than loud speaking projectors, there can be no "bedlam," and each lessee is given clear reception.

Superintendent Kopff believes in the practical application of the old adage: "All work and no play makes

(C. Western Electric Co.
Master Morty Gross listening to the radio which is amplified in each apartment in this new radio equipped apartment.

Jack a dull boy." He finds that the workers in the big boiler room of the Ritz perform their tasks with much more zest after intermissions or "recesses for radio."

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The Ultimate Coupler—How to Make It

By Arthur S. Gordon

YOU will enjoy making the improved variocoupler described and illustrated in this article. It represents the very peak of variocoupler construction and embodies the theories which are found in the best instruments on the market. It is designed especially for concert work, but a bank-wound loading coil connected in series with the primary and the antenna will transform it into the finest multi-wave tuner you ever

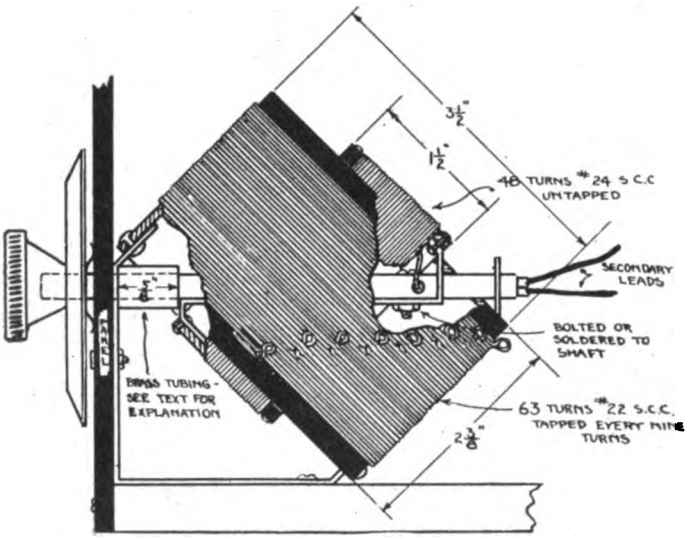

Fig. 1. Constructional details of the coupler described in the accompanying text. The secondary, or rotor, is fashioned to fit on a Z-shaped piece of metal allowing 180° variation, which is impossible with the present-day type.

saw. It was originally built for use in single or double-circuit regenerative receivers, but it may be used successfully in single or multitube reflex circuits, or in the reflex hook-up which employs a crystal as a detector.

The variocoupler has always been a favorite tuning device for both short and long wave reception. Usually there are two coils of wire in a variocoupler, one called the primary and the other called the secondary. The

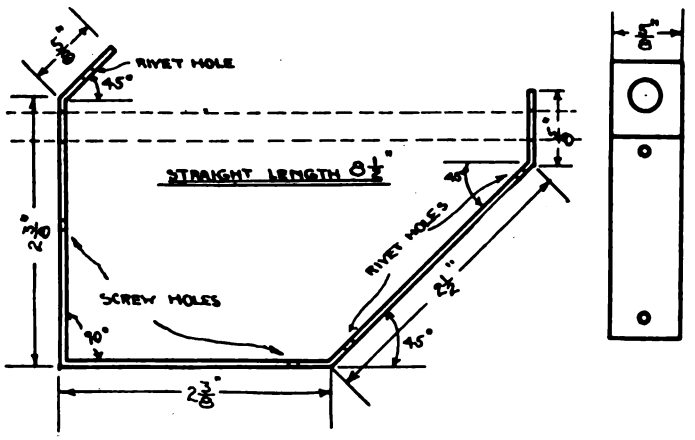

Fig. 2. The standard for the stationary coil is bent into shape from a strip of fairly heavy brass. It should be done very accurately if success is to be expected.

primary coil is stationary, is generally wound upon a tubular form, and is connected to the aerial-ground circuit as the main inductance. It carries the original current. The secondary coil is movable, is wound either on a tube or a ball, and is so placed with reference to the primary coil that a current is induced from one winding to the other. The amount of current so induced—or self-generated by the secondary on account of its nearness to the primary coil—is varied by moving the secondary in or out of the primary, as in a loose coupler, or by revolving the secondary in such a manner as to change the angle of its turns from zero to ninety degrees. This variable relationship of the two coils is known as coupling.

The particular instrument described here has the advantage of extreme coupling combined with the greatest amount of inductance. The movable coil is always in the center of the stationary coil, in which position it works best. The turns of the secondary are not divided on both sides of a spindle hole, as with most instruments. Above all, the construction of this Rolls Royce among couplers has been simplified so as to be within the mechanical skill of the average amateur. A glance at Fig. 1, which is an assembly view of the completed instrument, may disprove the preceding statement, but when it is considered that there is not a detail omitted from this assembly view, the preconception of difficulty disappears. In other words, Fig. 1 could be published without any text or detailed sketches, and a fair proportion of fans among us could build the instrument intact. However, a full explanation of how

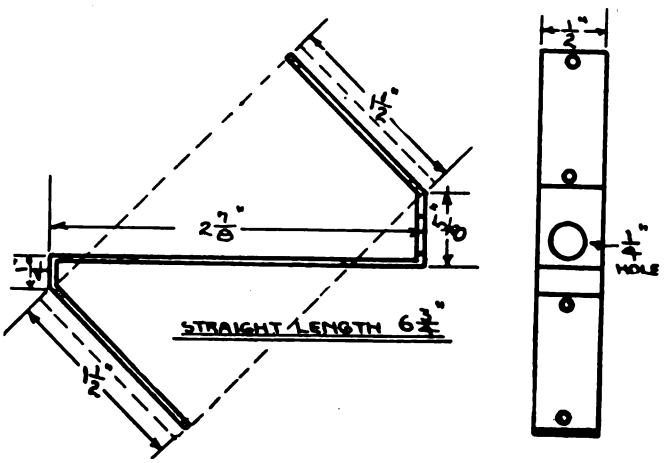

Fig. 3. The standard for the rotor which is bent out of heavy brass strip, and makes possible the 180° coupling.

to wind the coils, how to mount them and how to assemble them is given in the succeeding paragraphs.

The primary of this modern variocoupler is a stationary coil mounted at an angle of 45 degrees on a brass standard. This standard is fastened either to the back of the panel, to the baseboard, or to both, as shown in Fig. 1. The tube upon which the coil is wound may be either bakelite or cardboard. Bakelite is preferred on account of its higher insulating qualities and rigidity. The diameter is 3½ inches and the length 2⅜ inches. Sixty-three turns of No. 22 S. C. C. copper wire are about right for concert reception, with enough spare inductance to climb to 600 meters if desired.

There are no single taps on this coupler, eight turns being the closest to which the primary coil can be adjusted. Experience has demonstrated that while single taps on the primary of the coupler are sometimes needed, the majority of receivers work just as well without them. In other words, single wire taps are nice, but not exactly necessary. Close tuning is

(Continued on next page)

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(*Continued from preceding page*)

done by coupling, and by use of the variable condenser. Should any one care to include single taps, however, the first nine turns are brought in succession to a switch, then every nine turns thereafter. Otherwise bring out a tap every nine turns, making seven in all.

Begin the winding about ⅜-inch from the edge of the tube. Twist the beginning of the wire into a loop, wrap the twisted portion with a single layer of tape or adhesive plaster, and bind the first turn to the coil by passing the succeeding turns over the ends of the tape. See Sketch 1 of Fig. 5. This idea originated with an English amateur who passes it on for approval.

The winding, however, is not started until the standard for the tube is made and riveted in place. This standard serves the triple purpose of holding the coil at its proper angle, providing the rotor shaft with bearings and giving the instrument a base on which to stand. A strip of fairly heavy brass ⅝-inch wide and 8½ inches long is bent carefully into the shape shown in Fig. 2. Three rivet holes are drilled as indicated, being placed so that the rivets will be on the outer

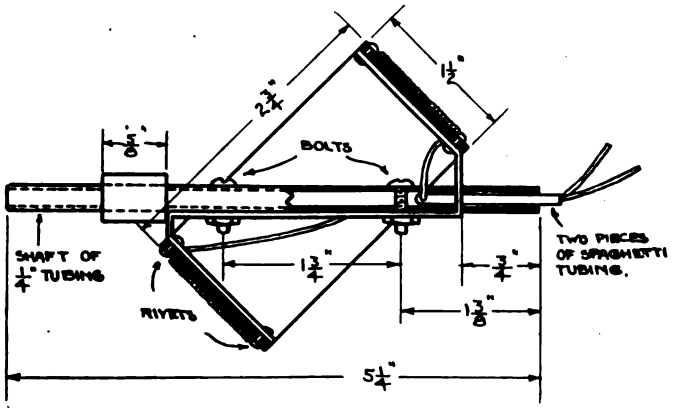

Fig. 4. Diagram showing the manner of fastening the coil on the standard. The shaft, which is hollow, is then bolted or soldered to the Z-shaped piece. This makes a solid looking and working rotor for the Ultimate Coupler.

margin of the coil and not so far toward the center as to interfere with winding. The screw holes are also drilled as shown.

In placing the two ¼-inch holes for the shaft, take pains to drill them so that the shaft is level. A slight inaccuracy here will make no great difference, however, as the inner coil is designed so as to allow a little leeway. In the interests of balanced operation, it is urged that more than usual care be taken.

For a detail of the rotor shaft, see Fig. 4. There it is shown to be, not a rod, but a brass or copper tube 5¼ inches long by ¼-inch outside diameter. It is drilled in four places. Two bolt holes are provided for small and thin bolts which are used to fasten the brass form on which the secondary coil is riveted, to the shaft. The details of this form, shaped like a letter Z, are given in Fig. 3. A strip of brass or copper 6¾ inches long by ½-inch wide is required. It is riveted to the inside of the secondary coils by four rivets, holes for which must be drilled beforehand. This Z shaped strip of brass is drilled with bolt holes to correspond with those on the shaft, and it is also drilled with a ¼-inch hole so that it will slip over the end of the shaft preliminary to bolting.

Of such a size as to slip over the rotor spindle is a short piece of larger brass tubing, ⅝-inch long. It is shown in Fig. 1 as a space washer between the upright leg of the primary standard and the forward end of the secondary form. This washer, or sleeve, plays a very important part in the mechanical—not the electrical—operation of the coupler. It cannot be dispensed with unless there is a shoulder on the rotor shaft so placed as to prevent the entire secondary element from moving forward. A movement in the other direction is prevented by the dial on the outside of the panel, with a spring placed between them to keep a necessary and convenient tension.

The secondary of this coupler is wound on a tube,

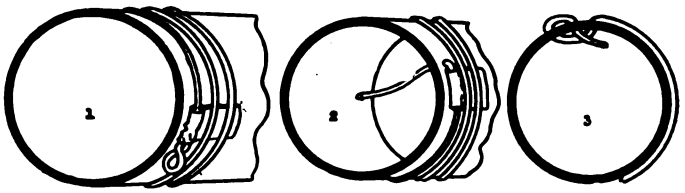

Fig. 5. Suggested method of fastening the first turn of the winding in order to prevent working loose. A strip of adhesive tape will do nicely.

rather than on a ball, 2¾ inches in diameter and 1½ inches long. Allowing ¼-inch margin along each edge, there is winding space for 48 turns of No. 24 S. C. C. copper wire. These turns are wound continuously and are not tapped. Suggestions for beginning and ending the winding are given in Fig. 5. Whether or not these suggestions are followed is of no importance, but be sure that both leads are brought inside the coils before calling the winding complete. For in order to give the secondary coil some freedom of motion, it is necessary to bring the leads out by way of the tubular shaft upon which the secondary is rotated.

This is done by drilling two holes in the shaft to the rear of the second bolt. The holes should be about ⅛-inch in diameter, or large enough to permit the passage of spaghetti tubing. They enter the tube from opposite sides and only penetrate halfway. The spaghetti tubing is then forced into the holes and out through the shaft at the rear of the coupler. The leads are then put through the spaghetti insulation, and they come out as shown in both Fig. 1 and Fig. 4.

The assembly drawing does not show the seven-point switch needed for the primary of this coupler. Otherwise, however, it is complete, showing the mounting of the instrument as well as the manner of its operation. In using a variocoupler in connection with a regenerative set, many amateurs employ the primary as a tuning inductance and the secondary as a tickler or feed-back inductance. This particular instrument works at its best with such an arrangement, but it is also supremely well adapted to every use to which other, and not so modern, couplers may be put.

A HALF - INCH RADIO RECEIVER

A radio receiving set so small that it can be used to replace the jewel in a lady's hat pin has been built by Allen Turner, of Los Angeles, California. The illustration on the right shows a view of the receiver, whose small size can be appreciated by comparing it with the fountain pen held alongside of it.

(C. P. & A. Photos)

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A Rectifier Made from Odds and Ends

By Ted C. Van Alstyne

FOR many people the stumbling block in radio is keeping the storage batteries charged. Lugging a forty or fifty pound battery to and from the garage is no easy task, especially if the garage is some distance away. Also, manufactured chargers come at high prices. The alternative then is to build your own rectifier to change the alternating current from the lighting circuit to a direct current to charge your battery.

An efficient rectifier can be made from odds and ends found in the cellar, dusted off and brought down from the attic or purchased at a figure within reach of all radio enthusiasts. If the instrument described in this article is carefully constructed it will be found adequate to charge a battery from which one or two bulbs are operated daily.

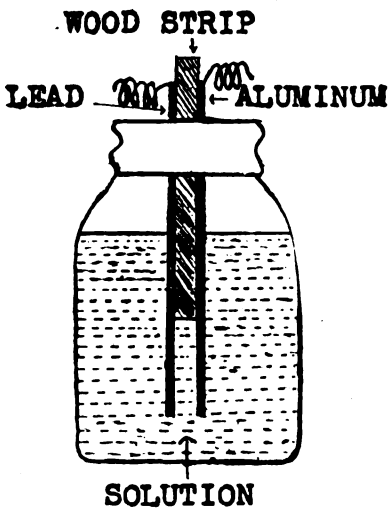

Fig. 1. Schematic drawing illustrating the method pursued in making up and arranging the elements of the rectifier.

First obtain from the top shelf in the pantry four wide-necked jars. The wider the tops the better. Fruit jars will do nicely. While you are in the pantry get the wife's supply of baking soda and bring it to the work bench. Cut from sheet aluminum four pieces six inches long and as wide as will go in the jars. About two inches will be the maximum width if fruit jars are used. Also make four pieces the same dimensions from sheet lead. If you have no lead, sheet iron or steel will do. It does not matter much about the thickness.

Screw one piece of aluminum and one piece of lead (iron or steel) to each side of a wooden separator ⅜-inch thick, four inches long and as wide as the metal elements, as shown inside the jar in Fig. 1. Make sure the screws do not go right through the wood and touch the other sheet of metal on the opposite side. The aluminum plates are the rectifying plates. The more surface exposed in the solution to follow, the more current will pass and thus charge your battery that much quicker. Small screws or nails driven into the edge of the separator at a point where they will rest on the edge of the container jar will keep the completed element in place and prevent a slipdown into the mixture.

Now obtain three quarts of distilled water. If you have no still and your neighbor is using his get it from a garage or a drug store. Saturate the water with the wife's baking soda. That is, add the soda until the water will not dissolve any more. An ammonium phosphate mixture is also good.

Next make a lamp bank from four ordinary electric bulbs and sockets. Old carbon bulbs discarded for their dimness or used in the cellar will be just as good as new ones. Fuse cut-outs will serve admirably for sockets if you have any on hand. This lamp bank is necessary to make up the resistance of the circuit so your new contrivance will not blow the fuses.

Connect a double-pole double-throw switch to your battery and rectifier, as shown in the complete hook-up in Fig. 2. This will facilitate a quick change-over from charging to ready for use. A snap switch will suffice for shutting off the alternating current power.

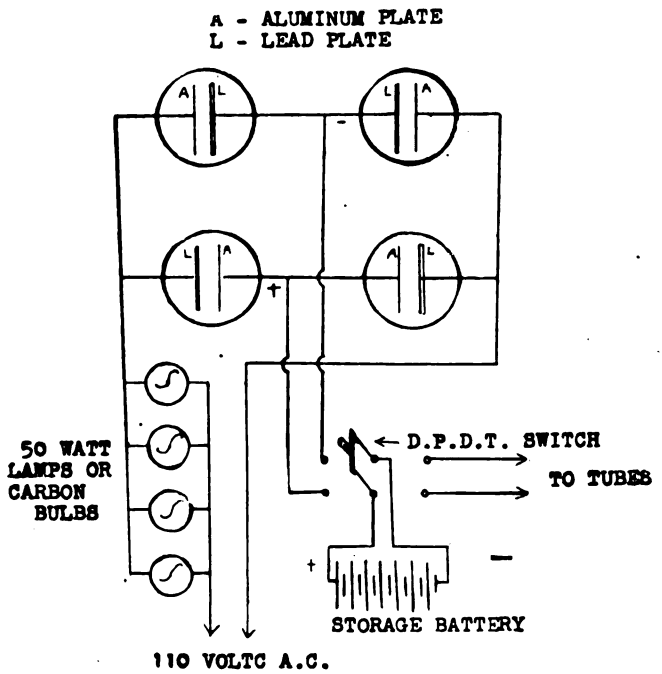

Fig. 2. Diagram showing how the rectifier should be hooked up, and also the method of connecting the series parallel bank of lamps.

The jars should be set in a tank about up to their necks in cold water to keep them cool. I used a cracker box of the well known tin variety. You will find that the jars heat a little when operated for a continuous period and the rectifying qualities diminish when this takes place, thus making the charging of your battery a slower process.

If the elements of each jar are connected with copper or brass ribbon and the cracker box given a coat of black enamel the finished instrument will have an attractive appearance.

When wiring the rectifier be sure the polarity is correct. Connect the aluminum plates through the change-over switch to the positive of the battery. The rectifier acts as a valve and allows the current to pass in one direction only—that is, from lead to aluminum plates.

Every two or three months empty out the solution and refill with fresh distilled water and a new supply of baking soda. Try the other chemical mentioned if you wish. You may find it necessary to replace the aluminum plates. Use only good metal. An alloy does not bring good results.

The weak spot in this type of charger is slowness.

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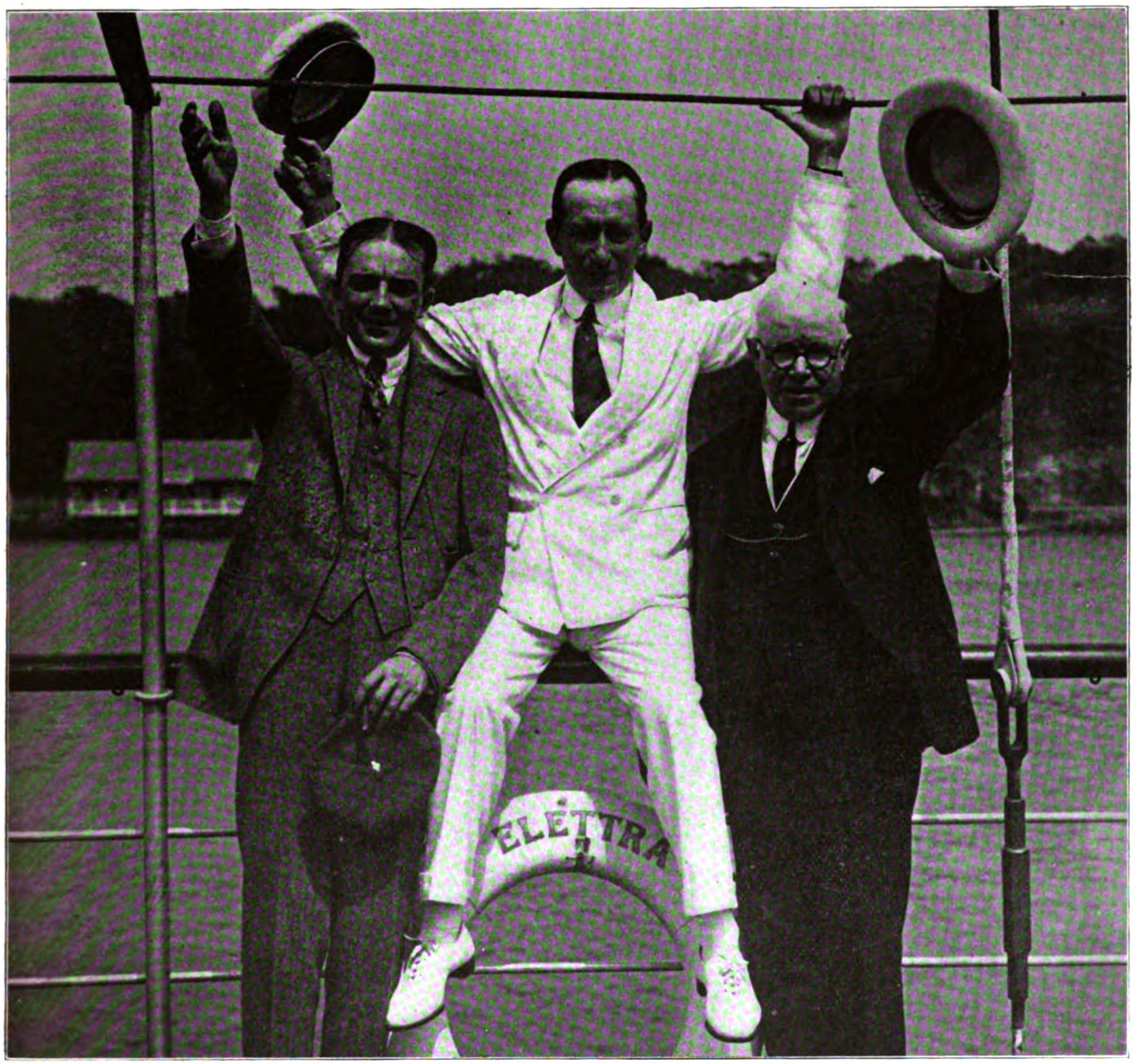
Marconi Perfecting Wireless Directional Control



(C. Underwood and Underwood)

This picture shows three of the foremost radio men in the world—Senatore Guglielmo Marconi, Owen D. Young and E. J. Nally—on the deck of Marconi's yacht, "Elettra." This photograph was taken on the occasion of Marconi's visit to Dr. Steinmetz, the famous electrical authority, and is one of the few photographs snapped of the wireless wizard when he was not working.

RADIO enthusiasts all over the country were greatly interested in the announcement from London last week that William Marconi, the eminent wireless pioneer, is confident of the successful development of a method of wireless directional control with which he has been experimenting. The inventor was quoted as saying that he hoped soon to perfect a device by which radio messages would be received only by the person or station for whom they are intended.

Mr. Marconi will conduct further experiments during April on his yacht "Elettra" off the coast of Spain, where he will receive messages from the station at Carnarvon, Wales.

It is understood in London that the device under development somewhat resembles receiving instruments by means of which stations are enabled to locate within a fraction of a second of arc the point of origin of the waves carrying messages.

"If my new device is successful, as regards controlling the air waves which carry messages, it will prevent waves spreading as they do now," Mr. Marconi is quoted as saying. "I can't go into details about it as yet. I hope it may be practical to regulate air waves, even as far as across the Atlantic. On my trip I am going south so as to be near port, instead of in mid-ocean, and we will try our tests on the far countries."

If the experiments are successful they will revolutionize existing radio so that messages will be received only by the station toward which they are directed.

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California Leads the States in Number of Broadcasters

CALIFORNIA still continues to lead in number of broadcasting stations, with 59 in operation, while Texas has climbed to second place with 36. Every state, except Mississippi, had one or more stations on March 10 when the total of broadcasting stations had reached 588, the highest point since this service was undertaken in September, 1921.

Of these stations 66 represent educational institutions and 67 are newspapers and periodicals dispensing information and news as well as entertainment. Several cities, a number of churches, theatres and, of course, many electrical apparatus manufacturers and distributors are also included. The number of stations in each state as of March 10 follows:

California	59	South Carolina	6	Missouri	25
Texas	36	Alabama	5	Washington	24
Ohio	31	Arizona	5	Illinois	24
New York	30	Idaho	5	Nebraska	23
Pennsylvania	28	Maryland	5	Kansas	19
Iowa	26	Montana	5	Oregon	16
				Indiana	15
				Colorado	15
				Michigan	14
				Minnesota	14
				New Jersey	13
				Wisconsin	11
				Florida	11
				Georgia	10
				Massachusetts	10
				District of Columbia	9
				Oklahoma	8
				Louisiana	8
				Connecticut	7
				Kentucky	7
				Arkansas	6
				North Dakota	5
				Tennessee	5
				Utah	5
				Rhode Island	4
				South Dakota	4
				Wyoming	4
				North Carolina	4
				Virginia	4
				Delaware	3
				Hawaii	3
				Maine	3
				Vermont	3
				West Virginia	3
				New Mexico	2
				Nevada	2
				Porto Rico	2
				Alaska	1
				New Hampshire	1
				Mississippi	0
				Total	588

Radio Popular With Yachtswomen

(C. Gilliams Service)

As sailing days come nearer, yacht owners are equipping their craft with the latest in radio, not only as a pastime, but as a safeguard. The above illustration shows a fair yachtswoman on one of the many craft that hover all year round off the Pacific Coast, enjoying a pleasant moment listening in to the program being broadcast from one of the powerful western stations. This pastime has become so popular that now, instead of thinking what color they are going to paint the craft, they are asking, "Where can I put my antenna?"

Gov. Smith's Family Enjoy Radio

(C. Keystone View Co.)

Governor Smith, of New York, when he does get a few moments to spend, generally turns to his radio receiver and listens in. His family have all been ardent radio fans and Governor Smith himself is said to be a "mean dial twister." The above illustration shows the Governor's family listening in on the latest Radiola set, designed and made by the Radio Corporation of America.

Panama Will Broadcast

AN agreement with the Panama Government places the control of all radio in the Canal Zone or in the Republic of Panama under the United States, and the Navy acts for the Government. Panama would like to break this treaty, it is said, and either set up stations of her own or let commercial concessions open stations there. Broadcasting and radiotelephony have accentuated this, and commercial companies desirous of selling their equipment are no doubt behind some of these activities. The Navy has authorized the stations in the Zone to broadcast entertainment programs.

Norwegian Broadcasting

THE Norwegian telegraph administration requires that a company to which a broadcasting license is issued must be a stock company backed by native capital, in which Norwegian radio manufacturers, press and local amusement syndicates are interested. Broadcasting is limited to entertainment, information and news, Consul Carlson at Christiania reports.

The station at Christiania will be used, it is said, for experimental work, but the matter transmitted will be "censored and edited" by the administration. Receiving licenses will be required and a charge will be made for them. Only Norwegian sets can be used it is understood, and although the company is not to have a monopoly on receiving sets, remuneration may be charged for broadcasting service subject to the approval of the Government.

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Secretary Hoover Wants Executive Order to Relieve Radio Congestion

THE Second National Radio Conference was opened in Washington, D.C., on March 20, 1923, by Secretary Hoover, of the Department of Commerce. President Harding will be asked to solve the difficulties now existing in radio broadcasting by issuance of an executive order putting into effect recommendations to be drawn by the conference. This action was made necessary by the failure of the recent Congress to pass legislation enabling the Department of Commerce to exercise proper control.

Secretary Hoover stated to the conference that the situation regarding interference of conflicting messages in the air had become worse than it was when the matter was laid before the law makers. The House passed a bill, but the Senate failed to reach it.

Since the first radio conference was held a year ago the use of radio has grown tremendously making it necessary, according to Mr. Hoover, to find new radio paths for broadcasting. At present there are 588 broadcasting stations where there were but 60 one year ago. Secretary Hoover suggested that by executive order it would be possible to open up to private stations the use of wave lengths between 600 and 1,600 meters, now limited to the Government.

General Squier of the Signal Corps emphasized the importance of reserving for the Government the right to use its own wave length in times of emergency, but could see no objection to relinquishing this exclusive privilege temporarily. Commander Bingham of the Navy said certain mobile branches of the Government had been overlooked in the allocation of wave lengths.

Amateur radio enthusiasts were advised that in the absence of a law on the matter their co-operation was essential to best results.

The statement made by Secretary Hoover at the opening of the conference follows:

The Department of Commerce has asked for the assistance of representatives of the various Government departments and of the various sections of the industry and of the profession surrounding the radio work to determine if it is possible to do something from an administrative point of view that will relieve the present interference and congestion in broadcasting.

You will recollect that we held a conference of this character almost twelve months ago, and the gentlemen who comprise the committee of the conference are much the same, with such replacements or such changes in Government representation as have been necessary.

At that time we considered the whole problem of interference for the purpose of making recommendations to Congress with a view to legislation that would relieve the difficulties. The legislation was presented to Congress; it passed the House, but failed in the Senate due to the congestion of other work. The consequence is that we have found no relief for the public and in the meantime the situation has become even worse than we could have anticipated.

At the time of the conference a year ago there were about 60 broadcasting stations, wheras today there are 588. At that time we estimated that there were something like 600,000 to 1,000,000 receivers, and now the estimates run from 1,500,000 to 2,500,000.

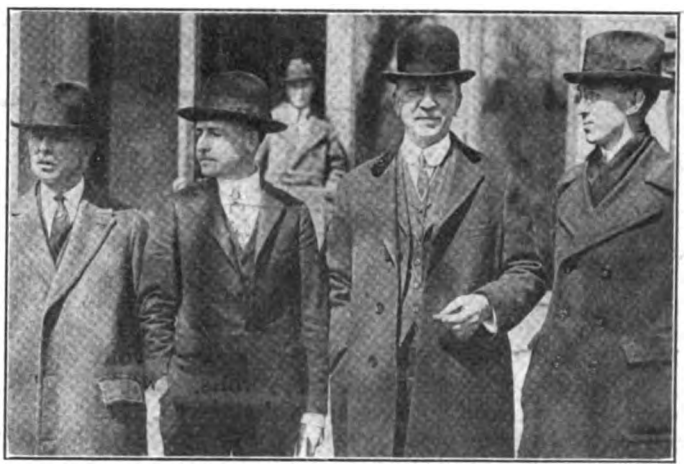
Public broadcasting has practically been limited to two wave lengths, and I need not dilate to you on the amount of interference there is and the jeopardy in which the whole development of the art stands. We must try to find some sort of solution by expanding the number of wave lengths available for public broadcasting.

The purpose of this conference is not to consider legislative questions but solely to consider what may be done by way of increasing the number of wave lengths, or wave bands, available for general broadcasting purposes.

As you are aware, the area from 600 to 1,600 meters is reserved for Government use. But if it meets the approval of the conference, the department will recommend to the President that some opening shall be made in that area for general broadcasting, to be accomplished by executive order.

The question is not so simple as it might appear on its face. The development of the art seems to show that the lower ranges of wave lengths are probably of more service in public broadcasting than the higher ranges, and it is of importance in developing the use of public broadcasting that we take no step that will interfere with the future development of the art and that whatever steps we do take, although they may be tentative in character, shall be constructively drafted in the direction of the best development of the industry and the art itself.

I have felt that the question involved in so important a method of communication perhaps only in its earliest stages of development, is so great and so important that we wish,



(C. Underwood and Underwood)

Government representatives at the Second Radio Conference, Washington, D. C., called to discuss methods of alleviating radio broadcasting congestion. Left to right: W. D. Terrell, Chief Radio Inspector, Department of Commerce; Dr. J. H. Dillinger, Chief of the Radio Laboratory, Bureau of Standards; D. B. Carson, Commissioner of Navigation, and L. E. Whittemore, Bureau of Standards.

that we must have, the best advice and cooperation from everyone who can contribute useful and thoughtful suggestions.

Due to failure of the legislation we are left without the necessary authority to effectually prevent interference. In seeking this authority we were supported by literally the entire radio public. They wanted to be regulated. We are now left where, if we accomplish anything, it must be by organized cooperation during the next year.

We have made the conference public. We are asking that everyone who can contribute some suggestion shall do so, and, in fact, we request anyone to appear who can be of service and give us the best of his advice.

We have had some study made of the problem by a group of men peculiarly able to give advice, that is the radio inspectors of the country. They have had to deal during the last twelve months with the complex problem of interference and a thousand difficulties; and in order that their views should be well formulated for the conference they have been in session for some time and have brought in a definite memorandum of suggestions. I thought that such a memorandum would be of more constructive assistance on their part than a public presentation of their views.

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The Radio Primer

For Thousands of Beginners Who Are Coming Into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Clearly Explained

By Lynn Brooks

IN the construction of single-circuit sets, what are some of the points of caution to be observed in order to make sure of the efficient operation of the circuit?

In the construction of the single-circuit set, which is the simplest circuit for the uninitiated constructor, the following precautions should be observed: The leads should be soldered for the best efficiency. Short leads should be used rather than strictly right-angle connections. The leads from the tube, such as the grid leak lead and plate lead, should all be made separately, and not tapped onto one another. The leads from the tickler should be made correctly, as the circuit will not function properly otherwise.

* * *

Is there any advantage to be gained by the use of double-circuit jacks in a set that comprises more than one tube?

The advantage gained by the little extra work in connecting up a double-circuit jack in a set that comprises more than a single tube is that there is no chance for any current being dissipated through leakage in the primary of the transformer. It also has the advantage of preventing any trouble arising from current leaking, as before stated, and setting up a back feed which might cause squeals and howls that would be objectionable.

* * *

Is a filament rheostat absolutely necessary in the use of the 1½-volt tubes?

This is a question that has been asked many times because of the fact that the tube takes 1½ volts and the dry cells are meant to furnish 1½ volts. While the 1½-volt tubes will, and do, take 1½ volts, they will often work more efficiently on much less, frequently taking not more than one-quarter of the actual voltage rating for their efficient operation. It is therefore absolutely necessary, for the correct functioning of the tube, to provide a rheostat for the control of the filament current.

* * *

Why is it possible to hear a squeal in a non-oscillating set when tuning in stations where they are nearly on the same wave length?

This is due to the fact that the two carrier waves of the transmitters conflict with each other, producing a "beat" note, which is audible. It is the same in basic principle as hetrodyning a non-regenerative set through the agency of a nearby oscillator.

* * *

Is the squealing above mentioned preventable?

This cannot be prevented because of the fact that, even though the set is not oscillating, the beat note will be audible, as explained before, and also because a set which does not produce oscillations of its own accord is not as sharp in tuning as one that oscillates.

* * *

When a receiver squeals over a wide scale without a station being heard, what is the trouble?

When this squeal occurs it indicates that the tube is being forced, and the following should be done: The filament current should be reduced; there should be less B battery used, and occasionally the trouble will be eliminated by varying the grid leak. Either lessening or increasing the resistance in the grid leak for each particular tube often stops this squeal.

* * *

In the use of some tubes microphonic noises are often heard, some to such an extent that it is unpleasant. Mention some ways of preventing this.

These microphonic noises, which are due to vibrations of the elements inside the tube, can be eliminated in the following manner: The tube socket should be mounted on heavy, thick felt, or very soft rubber, and no direct connection, such as screws, should hold the base of the socket to the base on which it is mounted. Another method is to mount the sockets on a sub-panel, which is suspended on springs, or strips of thick rubber, so that any vibrations will not be transmitted to the tube itself.

* * *

What is the correct position for the mounting of a tube? Does the position have anything to do with its operation?

In the mounting of tube sockets relative to the position of the filament the following should be observed: The tube should be mounted in such a manner that the filament is vertical. The reason for this is that, if the filament is mounted horizontally, it will sag, due to the heat expanding the filament, and in time will touch one of the other elements, which will short it. The position in which a tube is mounted has nothing to do with its operation. It is simply a matter of the care of the tube that it should be mounted as above outlined.

* * *

Is there any method of renewing the life of a tube after it has been shorted other than having it repaired?

A tube which is blown cannot be repaired, as can a light bulb, by tapping on the glass and fusing the ends of the filament together because of the fact that the filament is short and is stretched on holders that tend to keep it tight. When it is burnt out it is useless to attempt to renew it. Have a new filament put in.

* * *

What are "long-armed controls"?

"Long-armed controls" is a coined term to designate an extension on the tuning controls, generally a long piece of hard rubber tubing, which will allow the various controls to be manipulated without the necessity of bringing the body of the operator near enough to the set to allow the body to have the capacity effect.

* * *

Which is the best of the three methods of eliminating body capacity?

In the long run, it will be found that the shielding of the panel will give the most satisfaction, although the other methods outlined last week may be successfully employed. The shielding, however, will absolutely prevent any capacity effect being felt at all, while there is always the liability of the other methods not being efficacious enough to eliminate it entirely. This, of course, can be determined only by actual experiment.

* * *

Will the shielding of the panel eliminate the capacity effect felt in the phone circuit when the phone cords are grasped?

The capacity effect noticeable in the phone circuit cannot be eliminated by shielding the panel, and as a matter of fact it is almost impossible to eliminate it. This effect is noticed only when the body is very near the cords themselves. If the phone cords are left lying on the operating table without being held or moved away from the body, the capacity will remain constant and the capacity effect will not be noticed except when the arm or hand lies on top of the cords.

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Radio and the Woman

By Crystal D. Tector

THE doctor who lives next door to us has finally been invoked into the Radio Clan. And it really was funny how long he held off and what reasons he had for delaying the purchase of his set. He said that the constant listening-in was harmful to the ears, as it strained the nerves. But his wife, who by the way, is the president of our Matinee Club, kept after him for so long that he finally got a little bit of a crystal set, and had it two days, when he went down to New York one afternoon and ordered a set direct from the manufacturer. And now F. H. is jealous of it because it is more up to date than ours, but I say, "We'll let our Flewelling alone for a while, until you get up ambition enough to make one for yourself. I'm not going to let another manufactured set into this house until you show me that you can do as well as I did with mine." And that ends it.

* * *

I have been impressed so deeply and so often lately by the remarkable influence of radio on the country as a whole, that I have begun to take the indications of its far-reaching effects on the average person as a matter of course, and as the inevitable result of its widespread appeal and scientific worth. But when I accepted the invitation of a friend of mine to have dinner at her home recently, I little expected at the time that I was to witness again a specific instance of the happiness and contentment that radio brings into many homes.

My friend's mother is blind. The full significance of such an affliction cannot possibly be realized by those who are fortunate enough to be blessed with unimpaired sight. The ordinary pleasures, such as the movies, the theatre, the daily newspaper and books, are denied those who have lost their sight. But now we have radio.

No more need for those who are afflicted with blindness to sit through the long days in darkness. Radio has opened up the world to their sightless eyes through the medium of forgetfulness and the enjoyment born of "listening in." As I walked into the living room of my friend's home, the first thing to attract and hold my attention was the sight of a kindly, gentle little lady, sitting in her armchair, with a smile of contentment on her face. On her ears were a pair of phones. As I entered, she reached over to the radio set on the table by her chair, "tuned out," and greeted me in a manner more cheerful than I had ever noticed in her before.

"My dear," she said, "there are a great many things in life that seem unbearable at times. Until recently, I thought that blindness was one of them. But since Alice bought me this radio set, and taught me how to 'tune in' on the world, I think I have found at least partial compensation for the loss of my sight."

And before the evening was over, I knew by her animated conversation and the expression of happiness on her face that radio had made one more conquest; had brought joy and gladness into one more home, and I left with a still stronger feeling of thankfulness for the service it renders those whose lives previously had been lived in the shadows.

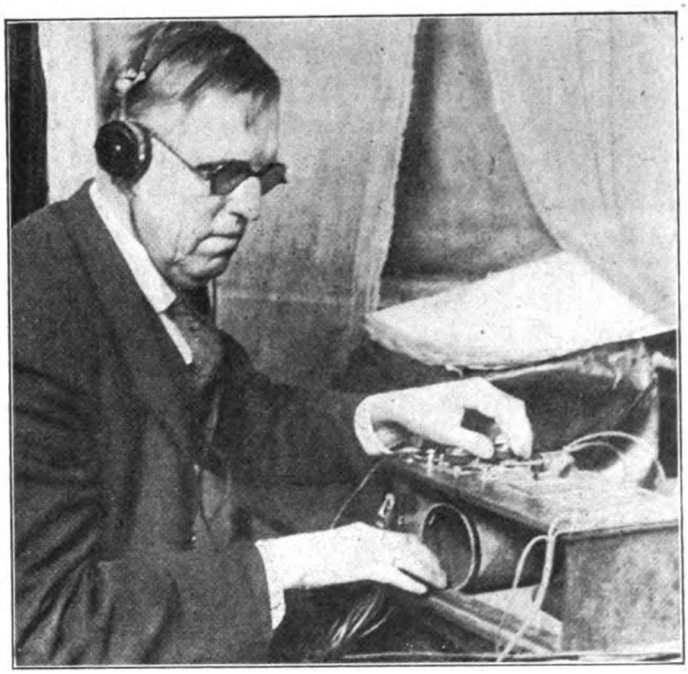
* * *

A friend of ours recently visited us, and upon seeing that we had a radio set told us that Billie, her son, had been bothering her to allow him to install one, but that she was afraid that it would be dangerous. "You know that with all those big stations sending, I thought that it would shock him, and probably kill him, poor dear." Well, I just laughed out so loud that she was very indignant, but when I explained that there was less danger of getting hurt from radio than there was in crossing 42nd street and Broadway at four o'clock in the morning, she sort of smiled weakly and in such a way that said, "Well that may be so, but I don't believe it." So I went into a long discourse and told her all about the way in which it was done, and I believe that she was convinced. You can just imagine my surprise when Billie called me up and told me to come over and "see the wonderful set Ma bought me for getting a good report card." Well, I thought that I was pretty good when I sold a booth at the county fair, but I think that I can pin a medal on my "Sunday go to meetin'" suit for that. The idea of anybody being afraid of anything these days. Why, I don't have a ground switch on our set, being confident in the lightning arrester that I have installed.

* * *

I ran in to see Ye Editor last week and he told me that my next contribution would be for RADIO WORLD'S birthday. Just think of it, folks, it's one year old this week and still growing better and better every day. I know that I am simply tickled to death, and the fact that he said that he was going to put a Special Dress on our magazine just made me leap with ecstacy. And the ads. Why, I never even saw anything like it. And to think that I am a part of it all!

Blind—Makes Own Receiver



(C. Keystone View Co.)

Clemens C. Niemeyer, of St. Paul, Minn., although blind, is not in the least handicapped. Being an ardent fan, he not only built his own set, but made three others for friends. He is fifty-eight years old, a piano tuner by trade and spends his spare time making sets and listening in. He winds the coils himself, and does everything, even to making the cabinets, which is in itself a job that a whole lot of amateurs would not tackle.

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The Neutrodyne Circuit Receiver

By Kimball Houton Stark

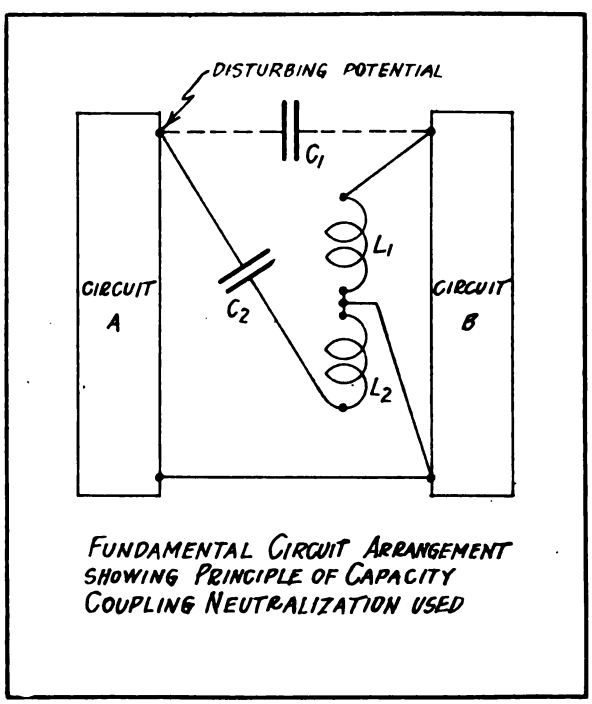
Chief Engineer, F. A. D. Andrea, Inc.

POSSIBLY the newest development in radio is the neutrodyne circuit invented and developed by Professor L. A. Hazeltine, professor of Electrical Engineering, at Stevens Institute of Technology, Hoboken, N. J.

Professor Hazeltine recently disclosed his circuits before a meeting of the Radio Club of America at Columbia University, New York City.

The object of the neutrodyne circuit is the neutralization of the capacity coupling between two or more portions of a given circuit. When used for the improvement of radio receiver circuits it eliminates the capacity coupling existing between plate and grid, thus preventing regeneration. This condition of neutralization is brought about by the adjustment of specially designed condensers placed in the circuit.

The fundamental circuit illustrating the neutrodyne principle is shown in Fig. 1. In the diagram, circuits A and B are coupled through the direct connection at the bottom and through the coupling capacity C1. To neutralize this capacity coupling two closely coupled

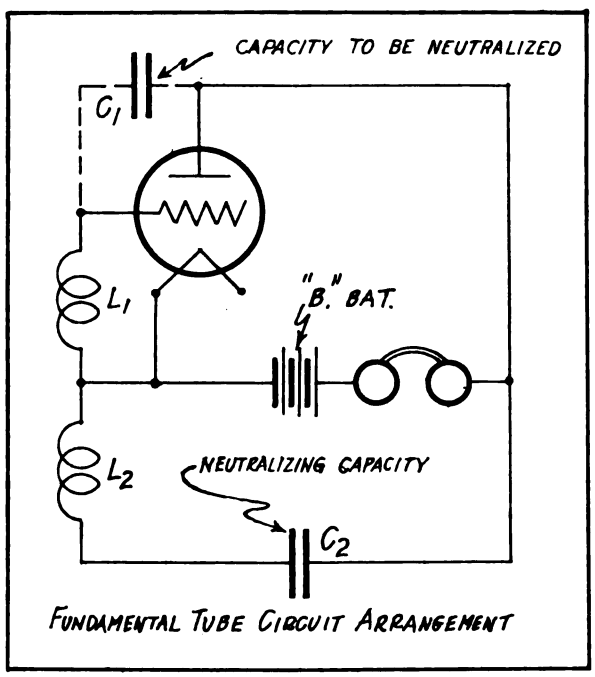


FUNDAMENTAL CIRCUIT ARRANGEMENT SHOWING PRINCIPLE OF CAPACITY COUPLING NEUTRALIZATION USED

inductances L1 and L2 and the neutralizing capacity C2, are arranged as shown, L1 being connected between one terminal on C1 and the common connection, and L2 being being connected in series with C2, between the other terminal on C1, and the common connection. Terminals of L1 and L2 which are connected together are of unlike polarity. If circuit A has a source of alternating current, the alternating potential at its upper terminal (marked disturbing potential) will send a current through C1 to circuit B, which current in flowing through the impedance of circuit B, will set up a voltage between the terminals of this circuit, power thus being transferred from A to B.

Now if the neutralizing circuit L1, L2 and C2 be introduced and so adjusted that the current through L1 magnetically balances the current through L2, no voltage will exist across either of these coils nor across circuit B, which is the condition desired to eliminate the transfer of energy.

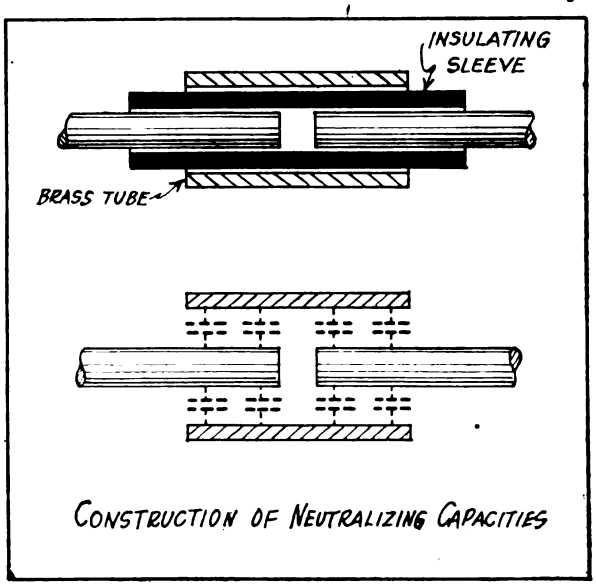
As directly applied to vacuum tube circuits, Fig. 2 illustrates the application. In this figure, the capacity C2, being correctly adjusted, neutralizes the grid-plate capacity, represented by C1.



FUNDAMENTAL TUBE CIRCUIT ARRANGEMENT

In actual practice inductance coils L1 and L2 may be respectively the primary and secondary inductances of air core radio frequency transformers. The secondaries of these transformers are preferably tuned by variable air condensers. A distinct advantage of the neutrodyne circuit is the fact that radio frequency transformers may be employed having a step-up ratio of windings of the order of one to four.

The adjustable neutralizing capacity in both Figs. 1 and 2 is designated as C2. In actual practice this capacity is adjusted in such a manner that the capacity



CONSTRUCTION OF NEUTRALIZING CAPACITIES

coupling between circuits is reduced to a minimum, if not to zero. The neutralizing capacity may have a capacitance of from 1 to 5 or 6 micro-micro-farads.

(Continued on following page)

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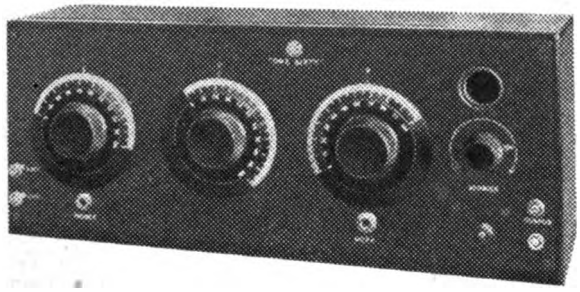
(Continued from preceding page)

Such a very small adjustable condenser is unusual even in radio. A condenser of this kind may be readily constructed as shown by the drawings in Fig. 3. It consists of an insulated sleeve in which are inserted two pieces of wire with about ⅛ inch space between them at the center. A metal tube is then adjusted lengthwise from the ends of the two wires, the resultant capacity being the series capacity of the metal tube and both wires. During tests this neutralizing capacity is adjusted and then sealed.



In making this initial adjustment, the receiver circuits are tuned to a strong buzzer signal, the filament of the tube whose capacity is to be neutralized is turned out, but the tube left in its socket. When the neutralizing capacity is properly adjusted under these conditions there will be no capacity coupling on either side of the tube and no buzzer signals will be transferred. If the tube, however, is taken out of the socket altogether signals will come in strong, being again neutralized when the tube is placed in contact with the grid and plate contact springs.

Such a method of adjustment illustrates that the neutrodyne circuit operates to eliminate capacity coupling and is not just a method for opposing the effects of regeneration, because the adjustment is made with the filament cold, and therefore, under conditions when the tube could have no regeneration.

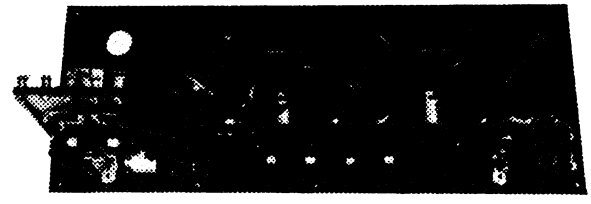
controls. Three of these are large dials for tuning control and the fourth knob is that of a vernier rheostat for the detector tube. A switch is shown at the lower right hand end of the panel for tuning on and off the filament current to all tubes.

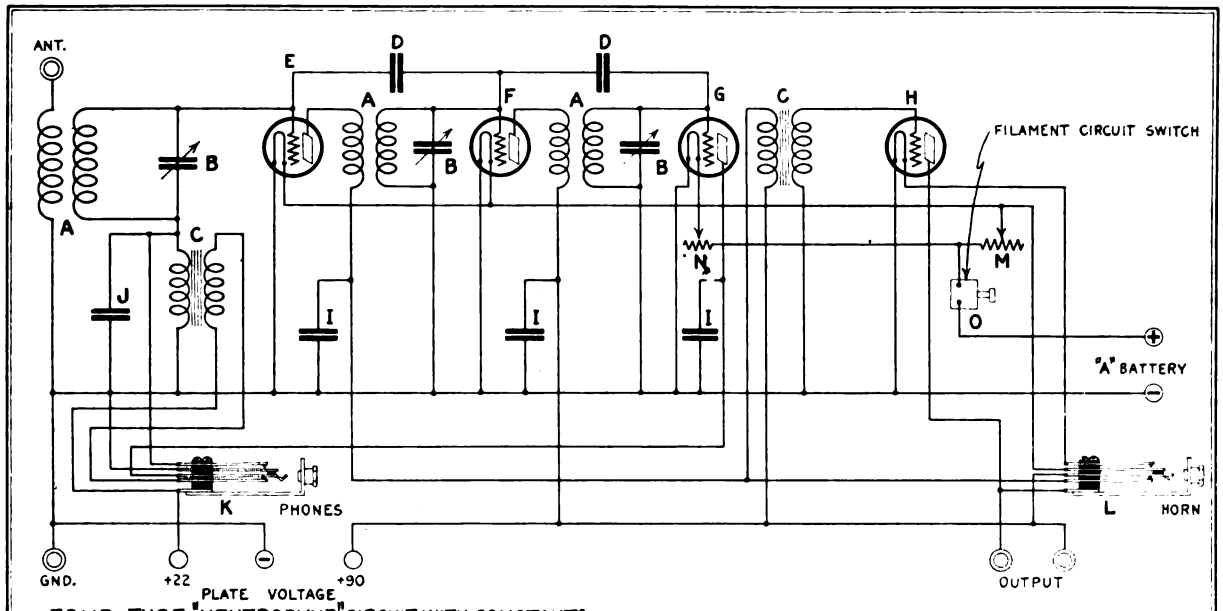
In the interior view, Fig. 5, the radio frequency transformer units are shown mounted at such an angle to each other that no transfer of electro-magnetic coupling can take place. The neutralizing or balancing capacities are shown above and between the transformer units.

Fig. 6 shows a complete schematic wiring diagram of the receivers illustrated in Figs. 4 and 5. The table of constants beneath the wiring diagram will explain the various parts of the circuit. This circuit using only four tubes actually does the work of five tubes as the first tube is used as both a radio and audio frequency amplifier.

It seems to be human nature for every one who owns any kind of a radio receiver to want to pull in long distance signals. To get stations a thousand miles away isn't enough, and we are continually staying up nights twisting dial after dial in an effort to bring in that station 1,500 or 2,000 miles away.

From this point of view receivers utilizing the neutrodyne circuit are certainly ideal. There being only three simple adjustments, nearly any one can learn to operate the receiver in a few moments and with exceptional results. In such a receiver, there being no regeneration and no re-radiation, obviously there will be no squealing and howling and interference will not be caused in passing over various carrier waves.





FOUR TUBE "NEUTRODYNE" CIRCUIT WITH CONSTANTS

A AIR CORE RADIO FREQUENCY TRANSFORMERS
B VARIABLE AIR CONDENSERS 0.0004 MFD.
C IRON CORE AUDIO FREQUENCY TRANSFORMERS
D ADJUSTABLE NEUTRALIZING CAPACITIES 1-5 MICRO-MFD.
E REFLEXED AUDIO & RADIO FREQUENCY AMPLIFIER TUBE
F SECOND RADIO FREQUENCY AMPLIFIER TUBE
G DETECTOR TUBE
H PURE AUDIO FREQUENCY AMPLIFIER TUBE
I RADIO FREQUENCY BY-PASS CONDENSER 0.001 MFD.
J BY-PASS CONDENSER 0.0001 MFD.
K SPECIAL TELEPHONE JACK FOR PHONES
L " " " " " LOUD SPEAKER
M POWER RHEOSTAT FOR AMPLIFIER TUBES
N VERNIER FILAMENT RHEOSTAT FOR DETECTOR TUBE
O FILAMENT CIRCUIT SWITCH

Figs. 4 and 5 show respectively exterior and interior views of a neutrodyne receiver being manufactured at the present time.

The front view of the panal in Fig. 4 shows only four

It will be found when a station is actually tuned in

(Continued on page 22)

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Radiograms

It is rumored that the French Line will equip all its passenger ships sailing out of New York with radio receivers and amplifiers for the reception of broadcast programs.

* * *

For the second time in a fortnight American concerts were heard in France when Paris wireless amateurs last week listened in on the Wanamaker organ recital broadcast from Philadelphia.

* * *

In January, 1921, a transcontinental amateur record of 6½ minutes for sending a radio message across the United States and return was established. Efforts to eclipse this record across Canada, from Montreal, P. Q., to Vancouver, B. C., will be made by amateurs this week.

* * *

Jane Cowl's interpretation of Juliet was broadcast one night last week across the entire country from Henry Miller's Theatre, New York City, where Miss Cowl is beginning her third month in "Romeo and Juliet." She gave the entire first act of Shakespeare's tragic love story to the United States by radio.

* * *

Free medical advice via wireless to Swedish ships at sea will be given on demand from leading hospitals in Stockholm and Gothenburg, providing the Swedish Government grants the request of the Department of Telegraphs to transmit such advice without cost. Sweden will be the first country in Europe to inagurate this kind of service, already tried out in this country.

* * *

Many thousands throughout the South who "listened in" on Atlanta, Ga., on a recent night learned something of the magnitude of the automobile industry directly from the lips of C. W. Nash, president of the Nash Motors Company. Mr. Nash spoke from the office of the Atlanta Journal. It was pointed out that in value of finished product the automobile industry ranks first in America, exceeding by a generous margin even the gigantic steel and textile industries.

* * *

The Monte Grande wireless station near Buenos Aires, Argentina, the first South American station in the international commercial radio system, is almost completed. It will begin service some time next summer. Argentina will then be placed in direct wireless communication with the United States for the first time, as well as with Europe. It is said that there are two strange, static "dead areas"—one near the equator off Brazil, and one in the South Atlantic—which only a station equipped like that at Monte Grand can overcome. The new station has been built entirely with American materials.

* * *

Before long a complete radio installation may be expected with every one of those homes on which you pay down all you could save in a lifetime and then face four mortgages. Already several builders around New York have held forth this added inducement to quit the noisy city and live in our better radio circles, observes the New York "Times." The experienced suburbanite who goes forth to look at a house no longer asks how far it is to school, whether city improvements have been made and what days the trains do not run. Instead, he talks about aerials, antennae, ground connections and all the other things that one has to have or do when he takes up radio.

A $1,200,000 real estate deal was completed by radio last week after E. Clifford Potter, cruising in the Mediterranean aboard the "Adriatic," had "sat in" with his colleagues in discussions of the deal in New York City.

* * *

Steel cages no longer prevent inmates of the Allegheny County Jail at Pittsburgh from enjoying the entertainments of the outside world. Warden Edward Lewis has installed a radio set, by which they nightly take "radio trips" to the various broadcasting stations.

* * *

A nation-wide survey by the Broadcasting Committee of the National Radio Chamber of Commerce discloses that "congestion of radio communication has increased to such an extent that the value of this medium to the public is seriously endangered by the resulting interference."

* * *

The Newspaper Proprietors' Association and the Newspaper Society in the British Isles have notified the Radio Broadcasting Company that no radio programs will hereafter be inserted unless paid for at regular rates. The broadcasting company replied that it would not use advertising space to announce its programs.

* * *

A report of the recent Firpo-Brennan prize fight by rounds was transmitted directly from a New York City broadcasting station and picked up at Saavedra, near Buenos Ayres, and was relayed by telephone to the newspapers in the city. It is claimed this was the first time that radio communication between the United States and Argentina was established successfully.

* * *

Receipt by the State Department of a report by the Commission of Jurists which met at The Hague last December is now followed by an announcement by Secretary Hughes that the Government might initiate action looking toward a treaty or a convention among various nations based upon the report as it affects rules of international law applying to radio and aircraft.

* * *

Just as radio is becoming so popular a new type of crook, the radio burglar shows up, taking the place of the sneak thief who a few years ago grew rich by gaining access to homes on the pretext that he was a telephone repair man. This is the assertion of the chief investigator for the burglary department of a New York casualty company, in issuing a warning to amateur radio fans not to admit to their homes radio repair men unless they can show credentials.

* * *

The medical profession has often been reproached with conservatism, but this tendency has not prevented the growing use of radio apparatus in the hospital, says Dr. Albert S. Hyman, of the Mount Sinai Hospital, Philadelphia, writing in "Hospital Management." It is Dr. Hyman's belief that radio equipment has a distinct and beneficial use in hospitals, particularly in those dedicated to the relief and convalescence of chronically ill patients, and to institutions situated afar from the large centers of population. The problem of keeping such patients interested in other things besides themselves, he says, is one which hospital administrators and others have pondered for many years. Occupational therapy, systematic exercises, physiotherapy, and allied fields are essentially devices for removing the patient from himself. To these has now been added radio.

(*Continued from page* 21)

that Dials 2 and 3 will read nearly the same, Dial 1 varying in setting with various antennae used.

Once a station is logged and notations made of the settings of all three dials the same station can be listened to at any later time by simply readjusting the dials to the given setting.

Some of the broadcasting stations heard from New York using only a 50-foot indoor antenna around the picture moulding of a fourth floor apartment are noted below together with dial settings. This reception was on the evening of March 8, 1923.

STATIONS HEARD FROM NEW YORK ON RECEIVER USING HAZELTINE'S NEUTRODYNE CIRCUIT

	Stations	Dial 1	Dial 2	Dial 3	Time P.M.
WBZ	Memphis, Tenn.....	40	67	66	9:35
WOO	Philadelphia, Pa.....	36	63	62	9:35-10
WEAF	New York, N. Y.....	30	56	57	9:35-20
WGY	Schenectady, N. Y.....	23	49	48	9:35-30
WJZ	Newark, N. J.....	10	42	41	9:35-40
WHB	Kansas City, Mo.....	31.2	60	59	10:50
WGM	Atlanta, Ga.....	38.2	65	64	10:56
CFCA	Toronto, Canada.....	47.2	72.2	71.2	11:00
WLAG	Minneapolis, Minn.....	38	58	57	11:15
WAAP	Wichita, Kan.....	20	52.2	51	11:30
WHN	New York, N. Y.....	19	47	45	11:45 A.M.
WSB	Atlanta, Ga.....	35	62	61	12:02
WDAP	Chicago, Ill.....	17	48	47	12:12
WDAJ	College Pt., Ga.....	17	45	44	12:15
WLW	Cincinnati, Ohio.....	38	41	40	12:17
WDAF	Kansas City, Mo.....	32	63	62	12:35
WSD	St. Louis, Mo.....	27	57.2	56	12:52
KFI	Los Angeles, Cal.....	49	71.3	70	....

WGY, Schenectady, N. Y., was received without aerial or ground and with very good intensity on a simple loud speaker.

Surely any receiver as simple to operate, which does not cause interference by re-radiation and which has the ability to bring in long distance stations such as are shown above, is an ideal receiver.

Hardly a day goes by that enthusiastic letters are not received from all over the country telling of exceptional results obtained with this circuit—results that did not require an expert to obtain.

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A Low Power C. W. Transmitter

By C. White, Consulting Engineer

WELL do I remember in the early days of radio when the owner of a vacuum tube was looked upon by his fellow fans as a sort of a "tin god." It so happened that one of these few "tin gods" lived in the next block and this particular fellow was an old chum of mine. We had both followed the science as closely as possible since in those days radio magazines were rather strange and unheard-of things. After the war we decided to carry on some experiments in radiophone which had been rather abruptly cut off. The first experiment was to develope a small transmitter. The transmitter was nothing more than a regenerative receiver with a microphone in the Ant.-Gnd. circuit. After much effort the set was so adjusted that radiophone messages could be sent from his house and received in mine on an ordinary crystal receiver I had always used for my code reception.

Amongst the C. W. amateurs the five-watt single tube transmitter is no doubt the most popular type. This type has won favor and its undisputed position owing to the fact that it is simple and extremely efficient. Its simplicity lies in the fact that no separate tube is used for modulation and its efficiency is due to the fact that it can be overloaded to a great extent without harm. In addition to these advantages it is extremely compact and when once correctly designed it works with the minimum number of controls. Of course, there are many types of tuning circuits that can be used with five-watt transmitters. The coupled circuit type and the single circuit type, or a sort of combination type, are most used. Then again, they can be classified in regard to style of modulation—direct carrier modulation, indirect carrier modulation, and direct buzzer modulation. Direct carrier modulation consists in placing the microphone in series with output of the oscillator and by talking into the microphone the resistance from aerial to ground is accordingly varied and hence the amplitudes of the carrier waves radiated from the antennae are functions of the microphone resistance. Such a method is not so very satisfactory since it is next to impossible to secure a good degree of variation in carrier wave amplitude. It is simple and effective in producing a rather pure modulation but poor in efficiency because only a relatively small audio-frequency is impressed upon the oscillator output. The indirect method makes use of a modulation transformer which serves a double purpose. This transformer not only steps up the audio-frequency voltage variations, but also acts as a filter in preventing the direct current flowing in the microphone circuit from associating with any of the currents in the oscillator. The advantages of this method of modulation are better control of the audio-waves through the variation of the direct current flowing through the microphone and more complete modulation of the carrier since this type of control is afforded.

In Fig. 1 is illustrated a simple type of single tube transmitter. The tuning inductance L is nothing more than the old double slider tuning coil type which is familiar to all and easily purchased or constructed. The condenser C-1 is a 23-plate air variable, C-2 is a .00025 micro-farad mica, and C-3 is a telephone type of condenser whose correct value of capacity will depend upon the make of modulation transformer employed. The amateur builder can easily ascertain the correct value to use by writing or inquiring of the manufacturer of the transformer. A condenser of .25 mfd. is quite often employed but sometimes smaller or larger ones are better with certain transformers. Likewise the value of grid leak will have to be determined by trial since each particular tube has a certain value of grid leak resistance at which it functions very much better than at any other value. The potentiometer P should have a resistance of 250 ohms and by its use it is possible to impress the correct potential on the grid of the tube, thus securing the point of maximum efficiency. The modulation transformer is so connected in the circuit that its output varies the impressed voltage on the grid of the tube, thus varying the amplitude of the oscillations being generated. If the amplitude of the voltage varied on the grid by means of the output from the modulating transformer be excessive the same will not only react to change the amplitude, but will also seriously disturb the oscillating balance of the transmitter and hence alter the wave-length of the

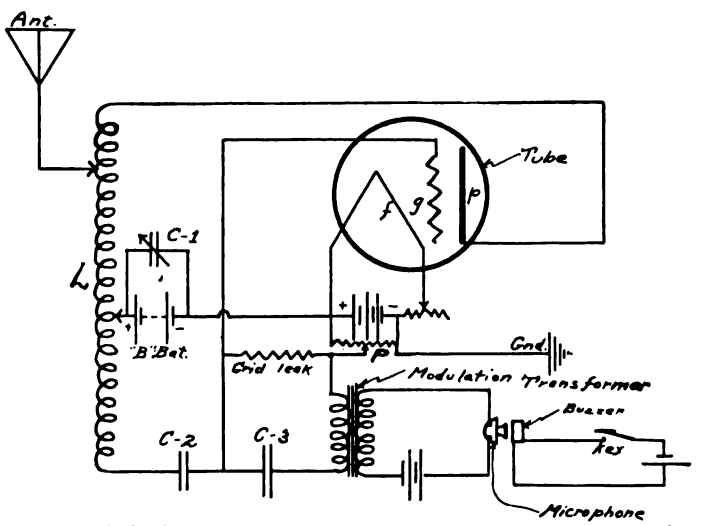

Diagram of the low power transmitter as described in the accompanying article. If the inductance L is constructed by the builder, extreme care should be taken in winding. Wire smaller than No. 22 should not be used. If a 5-watt tube is used larger wire should be used.

carrier wave in addition. Naturally this condition of affairs is quite undesirable, for the carrier wave frequency must not be altered by the modulating apparatus other than to the extent of the upper and lower side-bands. Such trouble is often removed by reducing the voltage of the battery in the microphone circuit.

In order to be able to transmit code when desired, a small high pitch buzzer should be included in the station equipment. By placing the buzzer close to the mouthpiece it is possible to transmit a clear characteristic note. If so desired greater modulation can be obtained when sending code by connecting the buzzer contacts in place of the micro-phone terminals, but the set is more flexible as illustrated. For local work the set can be used as a radiophone and for distant work buzzer modulated signals can be sent out over space. Of course, it is highly imperative to operate the set with a high plate voltage. The tube must be slightly overloaded in this regard in order to get good efficiency. Indicating instruments are a great aid in obtaining consistent results night after night. With but little experience the operator can easily tell if something has gone wrong with his outfit. A hot wire ammeter in series with the antennae and a similar type of ammeter in series with the plate of the tube will greatly aid the operator.

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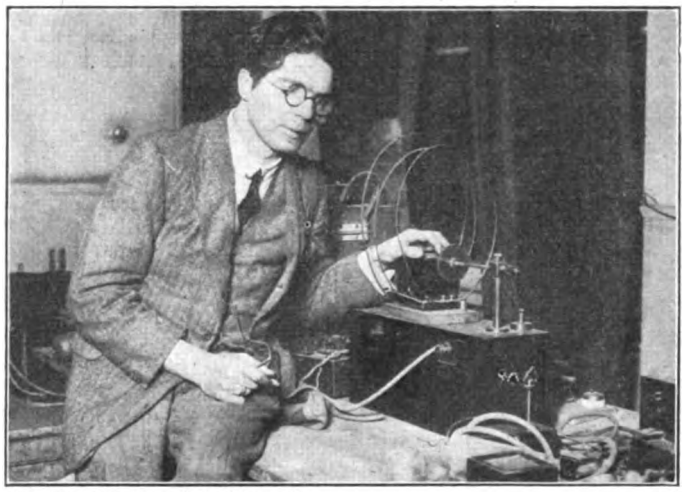
Radio World Begins Its
Interesting Pictorial Arra
Captions by Rob

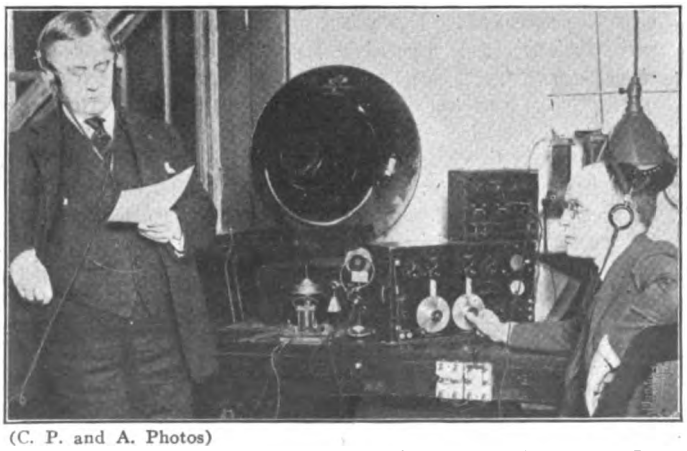


(C. Underwood and Underwood)

With the establishment of broadcasting stations throughout Great Britain many of the model makers have turned their thoughts and efforts to radio, and find in it a marvelous field for experimentation, just as the American amateur has for the past few years. The above illustration shows an interesting phase which has been taken up by Professor Low.

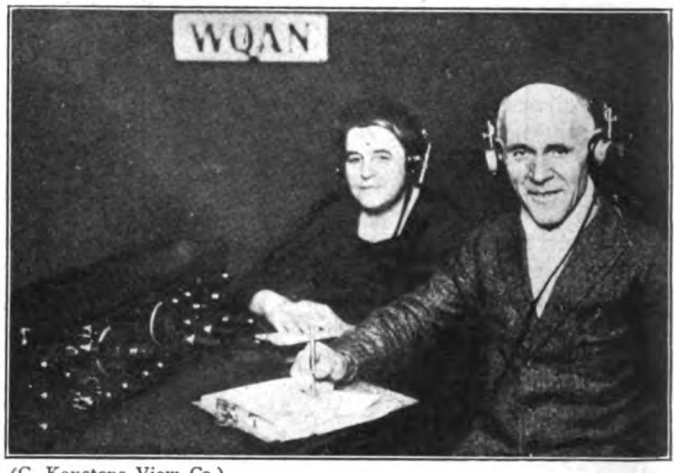
(C. International Newsreel Photo)

Mrs. Edward M. Munzer, of Hewlett, Long Island, who enjoys the distinction of being the only woman radio engineer in the world. Mrs. Munzer is a graduate of the Massachusetts Institute of Technology, with the degree of Chemical Engineer. The above illustration shows her in her laboratory.



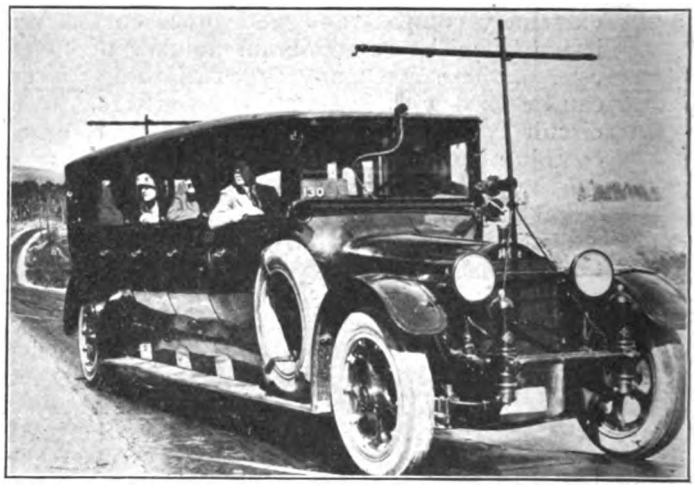
(C. P. and A. Photos)

Postmaster General New and Colonel Henderson, Second Assistant Postmaster General, receiving daily reports on their radio set from the Post Office Department.



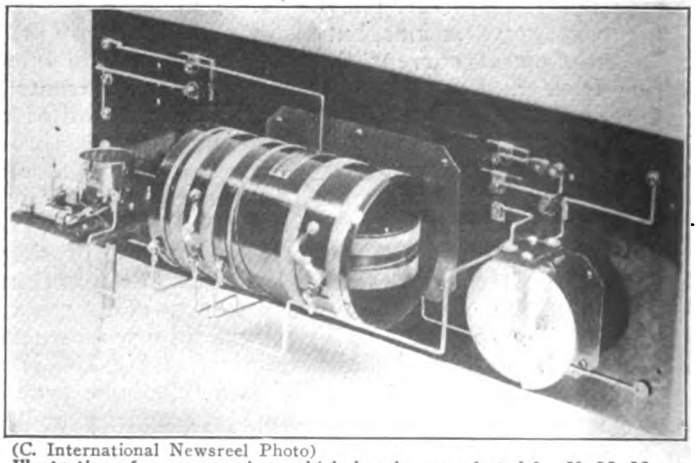
(C. Keystone View Co.)

After half a century of deafness, John Finnerty, pictured above, was enabled to hear for the first time by the aid of radio. He asserts it was one of the most exciting experiences of his life. Although it was **at first seemingly impossible, Mr. Finnerty was able to distinguish between voice and music. His wife, who also is deaf, underwent the same test, but was unable to detect any tangible sound.**



(C. Gilliams Service)

W. E. Travis, president of the California Transit Company, Oakland, Calif., recently sent out the first radio equipped bus on its regular run to Sacramento, and the passengers were enabled by means of the powerful receiving set which has been installed as part of the equipment, to enjoy the radio concerts broadcast from the powerful Los Angeles stations.



(C. International Newsreel Photo)

Illustration of a new receiver which has been perfected by **V. M. Moen,** St. Paul, Minn., and which is extremely flexible and sensitive. **The** feature of this circuit is the combined variometer unit shown **which is** composed of two rotors which take the place of the two variometers **and** variocoupler in the regular regenerative circuit.

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ts Third Volume With This ay Caught By the Camera

Robert L. Dougherty

(C. Underwood and Underwood)

"Uncle Robert," who devotes his life to making things easier for the blind and otherwise unfortunately disabled, holding three-year-old Evelyn Kriloff, while she listens to the radio concert. Uncle Robert has done much to cheer the disabled.

(C. Underwood and Underwood)

The way they do it in the modern conservatory, as shown at the Third Annual Radio Convention, held at the Hotel Pennsylvania. The set is complete in itself, using a loop antenna and a loud speaker in conjunction with a powerful receiver.

(C. Kadel and Herbert)

William Henderson and his super-heterodyne receiver which he constructed after school hours. The receiver is of the eight-tube type and he has succeeded in picking up stations 2,500 miles away on the loud speaker, an accomplishment that is wonderful in itself.

(C. Fotograms, N. Y.)

Sir Gerald Du Maurier, noted English actor, is an ardent radio fan and has located his receiver in a sectional bookcase, so that it will be kept dust-proof when it is not in use. The set shown is of British manufacture and utilizes seven tubes. He has done some remarkable work with it.

(C. International Newsreel Photo)

An illustration showing that the United States is not the only place where radio is popular. A London family is here shown listening in to a play at the Hippodrome, just as the American fans listen in to opera.

Answers to Readers

I AM building a regenerative set incorporating one stage of radio frequency, detector and one stage of audio frequency. I am in doubt as to how to arrange the tubes, so am enclosing a sketch of how I intend to do it. Can you offer any suggestions as to a better manner?—Charles A. Galton, Bloomsburg Hosiery Mills, Bloomsburg, Pa.

The sketch you enclose is quite correct with one exception. The tubes preferably should be arranged in the following manner: Instead of detector, radio frequency amplifier, audio frequency amplifier, it would save wiring trouble and time if you arranged the sockets and wired them as radio frequency amplifier, detector and then audio frequency amplifier. This method will save lots of space, as you will then be running your wires in correct continuity with the phases in which the current travels through the circuit.

* * *

Where can I obtain a hook-up of the flivver set described in RADIO WORLD*?—Richard Jenkinson, 264 Liberty street, Paterson, N. J.*

If you will write to the Permanent Radio Fair, Hotel Imperial, New York City, you will be able to get the information you seek.

* * *

Kindly let me have a diagram for a stage of audio frequency to be added to my set. I already have detector and two stages and desire to add another stage. I have added two stages of radio frequency, but it doesn't seem to make the signals louder at all, or not what would be expected of two steps. What is my trouble?—Edward L. Richardson, Coffeyville, Kan.; P. O. Box 267.

We refer you to the diagram in this department in answer to a query on the Flewelling circuit. You will note that it is two stages, but when you construct it just end your construction at the first jack leading to the transformer. The variometer you state you have is not necessary in this circuit, as the only apparatus you need is a transformer, socket, bulb, rheostat and panel. Of course, extra B batteries are necessary.

You will not notice any appreciable increase in the strength of the signals when you use radio frequency, but a noticeable increase in the clearness of signals will be noted if you have the circuit hooked up properly. The use of radio frequency increases the distance, but not the strength so much. It clears up the signals appreciably.

* * *

1. *Kindly publish hook-up for the following: Variocoupler, condensers, W-D 11 tube, variable grid leak, etc.*

2. *Does it matter which lead from the rotor goes to the plate?*

3. *In the hook-up where could I place a 23-plate condenser to the best advantage?—Earle Vanderlick, 1920 West Broadway, Minneapolis, Minn.*

1. We refer you to the hook-up published on page 20 of RADIO WORLD for March 17, 1923. The two condensers are used in the places marked, while the one across the rotor is optional, meaning that it can be used if found convenient.

2. Yes. The leads of the rotor will interfere with the working of the circuit if they are not connected right. This can be determined by switching them and finding which works.

3. The two condensers are marked.

* * *

Kindly tell me of a method of decreasing the clicking interference caused by a pole-changer located in a telephone office near my receiver. Have tried using condensers. —Henry M. Willard, New Berlin, N. Y.

If you refer to RADIO WORLD for January 20, 1923, you will find the method of eliminating interference described on page 20 in answer to an inquiry very much the same as yours.

* * *

Have constructed a radio outfit for use on the dash of my Hudson speedster, but have had trouble to get a good ground. Am using a five-foot loop, but cannot figure out how I can make a ground on the car.—Harry Gill, 405 Searvin avenue, Bridgeport, Conn.

When you are using a loop antenna you do not need a ground. That is one of the advantages of the loop antenna. It is connected directly across the circuit in place of the secondary of the tuner, and the tuning is done by means of a condenser in parallel with it. Don't try to get a ground, as it is not necessary. We advise using at least one step of radio frequency with this type of receiver, especially as you intend to use it on a car.

* * *

1. *Can slate be used successfully for radio panels?*

2. *Would sections cut from a phonograph record be of use for a panel?*

3. *What plate voltage should be used on a detector and two-stage amplifier set using W-D 11 tubes?*

4. *Can more than two stages of audio frequency be used successfully without the use of power tubes?—Olney Wilbin, Hartland, Me.*

1. Slate can be used as a panel, but it is not advisable because, as a rule, a vein runs through the slate which partially destroys its insulating qualities; also, it is hard to work, and is not as good as even poor-grade, hard rubber. Better use the regular paneling and save trouble.

2. You can use the composition of which records are made if you wish. It makes a good insulator for panels, but is extremely brittle. Care has to be taken when drilling and working it.

3. In using the W-D 11 as detector 22½ volts is sufficient, but when used as an amplifier it works best with 45. You can, however, place 60 volts on the plates of the amplifier without harming them.

4. You can use more than two stages of audio frequency without the use of power tubes; but if you do you will be bothered with excessive tube noises, which always are noticed when more than two stages of audio frequency are used.

* * *

In regard to the hook-up published in RADIO WORLD *for February 17, 1923, by G. W. May: Can a W-D 11 tube be used with this set? What parts are necessary for the construction of this set?—Edward A. Futter, 21 Hunter street, Newark, N. J.*

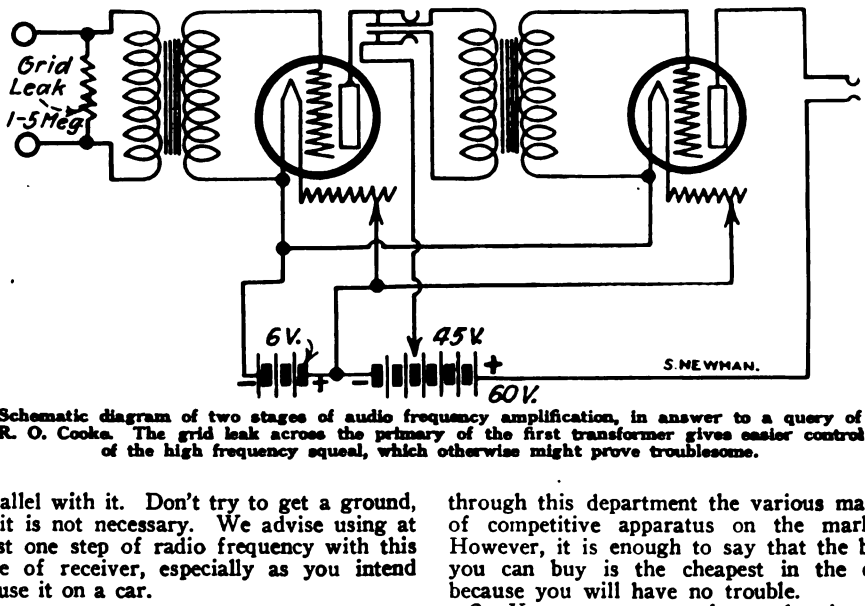
This hook-up can be used successfully with a W-D 11. The parts necessary for the construction of this set are: A honeycomb coil mounting, variometer, rheostat, socket, tube, grid leak and condenser, A batteries, B batteries, .001 variable condenser, and the necessary wire for connections. The diagram in the issue you mention is the only one that can be had, and it can be made no simpler.

* * *

1. *In the circuits published in the February 24 and March 3 issues of* RADIO WORLD*, what radio frequency and audio frequency transformers can be used?*

2. *Will the U. V. 201A function in these circuits?—A. B. Morrison, 119 West 8th street, Bayonne, N. J.*

1. We cannot discuss or recommend through this department the various makes of competitive apparatus on the market. However, it is enough to say that the best you can buy is the cheapest in the end because you will have no trouble.



Schematic diagram of two stages of audio frequency amplification, in answer to a query of R. O. Cooke. The grid leak across the primary of the first transformer gives easier control of the high frequency squeal, which otherwise might prove troublesome.

2. Yes, you can use these tubes in this circuit.

* * *

1. *Where can I obtain reflex circuits embodying both crystal and tube detectors?*

2. *Are special transformers needed with W-D 11 tubes?—E. H. Guy, 4943 Monticello avenue, Chicago, Ill.*

1. If you will refer to RADIO WORLD for February 24, 1923, and March 3, 1923, you will find the information you want under the heading "Reflex Circuits," by W. S. Thompson.

2. No special transformer is needed, but a transformer which has a high ratio works best with these tubes. There are several on the market.

* * *

Kindly furnish me with a two-stage audio-frequency hook-up in accordance with the information in this column last week, using a grid leak across the primary of the first transformer in the Flewelling circuit.—R. O. Cooke, 2256 Broadway, New Haven, Conn.

The hook-up you request is published herewith.

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Factors Which Affect Selectivity

By W. S. Thompson, E. E.

WITH broadcasting conditions as they are today, a receiving set that is very selective is of the utmost value and is practically a necessity. By definition, selectivity is the ability to tune in one of the many transmitting stations and tune out all others. This is very difficult when two or more transmitting stations are sending at exactly the same wave length and are equally distant from the receiver. However, the broadcasting stations of today usually differ in wave length from two to fifty meters, so by constructing the receiving set along the lines of best design it will acquire the characteristic called selectivity.

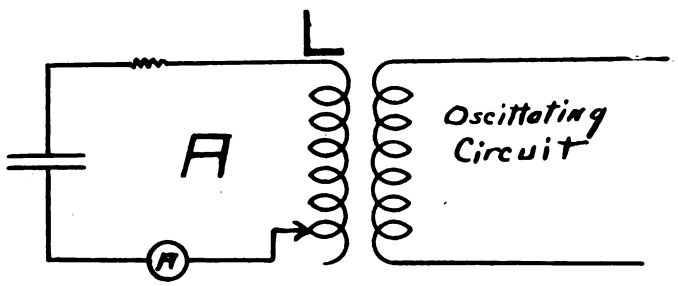

Fig. 1. Illustration depicting tuned primary circuit of a simple set, with ammeter in circuit to show current flow. This is the simplest type of oscillatory circuit.

In order to show the effect of different factors upon selectivity, the author has performed the experiments discussed below and has given reproductions of the graphs plotted from the data taken during these experiments. The resonance curves given are curves in which distances above the horizontal axis represent certain amounts of current, and distances to the right of the vertical axis represent wave lengths to which the circuit in question is tuned. Thus, by plotting change of current against change of inductance, the curves show at a glance how a given change of inductance will affect the current.

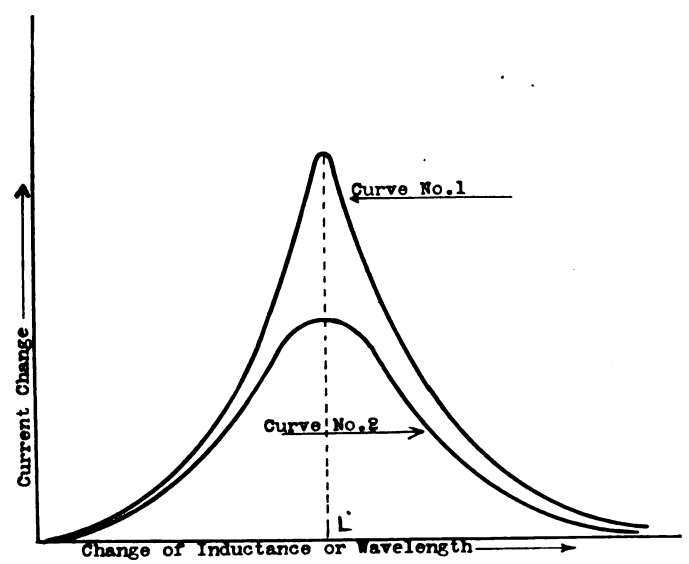

Fig. 2. Curve plotted to show current change as inductance is changed in the circuit.

One of the most important factors in making a set selective is to have a minimum resistance in the circuits making up the set. This is accomplished by using a large size copper wire for connecting all apparatus and by carefully soldering all connections. Any loose connections and any small size wire introduces resistance, the effect of which will be shown. In order to illustrate the effect of resistance on the selectivity of tuning we will take the case of an antenna circuit consisting of capacitance and inductance. Fig. 1 is the equivalent circuit of a tuned primary circuit of a simple set with an ammeter introduced to show the current flow in this part of the apparatus, which is coupled to an oscillating circuit as shown. The oscillations in this generator circuit are of a definite wave length corresponding to a transmitting station. As the value of the inductance L is changed from minimum to maximum the deflection of the ammeter rises to a maximum value and then decreases to a low value as shown by the resonance curve 1 in Fig. 2. When the inductance L is at a value L, the current flow is a maximum so we say that circuit "A" is tuned to the same wave length as the oscillating circuit. Curve 1 has a sharp peak at the top which shows if we either increase or decrease the value of the inductance L a very small amount

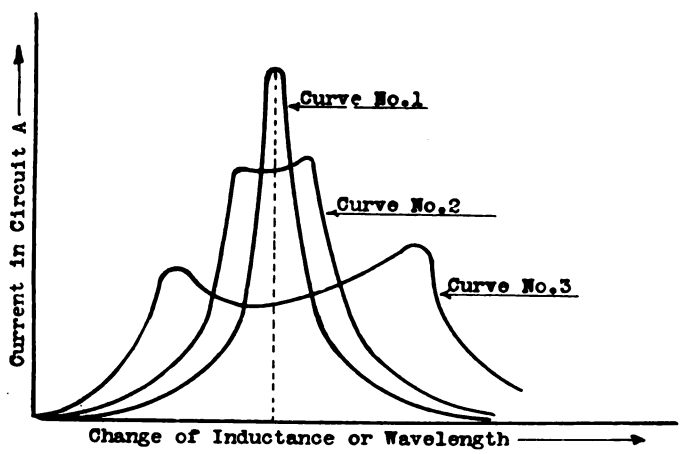

Fig. 3. Three curves plotted for three different values of coupling, showing the difference in the peak of the wave when close, medium, or loose coupling is used.

the current will fall to a much lower value. This means that if there is a sharp peak on the resonance curve of a circuit and there was a telephone receiver circuit in place of the ammeter, that a small change of the inductance would cause the induced current to fall to such a low value that there would be no response in the phones, showing that the response to a given transmitter is only on a very small portion of the variable inductance and the circuit is said to be selective. Now suppose that there was a high resistance in this circuit and again the circuit was tuned as before. The value of current shown by the ammeter would follow the resonance Curve 2 of Fig. 2. From this curve we can see that a small change of the inductance L would not affect the value of the current to any great extent. That is, if there was a telephone receiver circuit in place of the ammeter, the intensity of the sound would not change for a small change of L hence the curve shows that the addition of resistance broadens the tuning to a very marked extent because a very large change of L would be necessary to tune out any transmitting station. This discussion of resistance broadening tuning applies to all circuits of every type of receiving set, so the importance of large bus-bar connec-

(*Continued on following page*)

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(*Continued from preceding page*)

tions and soldering cannot be too strongly emphasized.

Another very important factor affecting selectivity is the coupling between circuits. In this discussion Fig. 1 will represent a secondary circuit "A" coupled to an oscillating antenna circuit as shown. The ammeter will take the place of a crystal and telephone receivers in order to show exactly the values of current induced in this circuit by the coupled primary. The procedure in conducting this test was to set the coupling as tight as possible and then tune circuit "A" taking values of current for different settings of the inductance "L" as in the preceding experiment. This procedure was repeated for three different values of coupling; that is, for very close, medium and loose coupling, giving the three curves shown in Fig. 3. Curve 1 represents the resonance curve with loose coupling, showing the sharp peak which is the characteristic of a very selective circuit. Curve 2 is the resonance curve for the close coupling and has a rather flat top showing that with this coupling a considerable change of inductance L would be necessary to change the intensity of signals. Curve 3, that of the very close coupling, has two distinct peaks, showing that the circuit will respond to the same transmitter at two different settings of the inductance. This would be a very bad state of affairs in a receiving set, for it would be almost impossible to separate two stations if they were sending on wave lengths nearly the same. From these curves the conclusion must be drawn that by loosely coupling the circuits of a receiving set, selectivity will be gained. However, advocates of closely coupled circuits, claim that loosely coupled circuits always greatly reduce the signal strength. The fallacy of this argument will be shown by the following procedure: Circuit "A" was tuned to give maximum response as shown by the ammeter and then the coil "L" was removed far enough away from the corresponding coil of the oscillating circuit until there was no response in the circuit "A." Then coil "L" was moved toward the oscillating circuit coil until the coupling was very close. The current in circuit "A" as read from the ammeter, followed the curve in Fig. 4, showing that the current increased as the coupling was tightened, until a certain degree of coupling was reached after which any further tightening of the coupling decreased the response. This clearly shows that very close coupling does not give the maximum signal strength. The explanation of this phenomenon is that when the coupling is very close the secondary circuit gives back part of its induced energy to the primary, hence weakening the current in the secondary.

Fig. 4 also shows that if the coupling is loosened beyond the point which gives maximum response, the intensity of the signal strength will decrease. This property may be made use of in a very interesting way. By referring to Fig. 5, the solid lines represent the resonance curves of Circuit "A," Fig. 1, for two different wave lengths, corresponding to two different transmitting stations sending at the same time. The line "I" represents the value of current necessary to give a response in telephone receivers, and as these two resonance curves overlap above this value of current, there will be interference between these two stations. That is, both stations will cause a response in the receivers at the same time. However, if we loosen the coupling between the two circuits, until the response in the secondary circuit is less, the two dotted resonance curves will then represent the response to these two stations. As the two dotted curves do not overlap above the critical current of the telephone receivers, there will be no interference between these two stations. As the two dotted curves do not overlap above the critical current of the telephone receivers, there will be no interference between these two stations, so that one and only one will be heard.

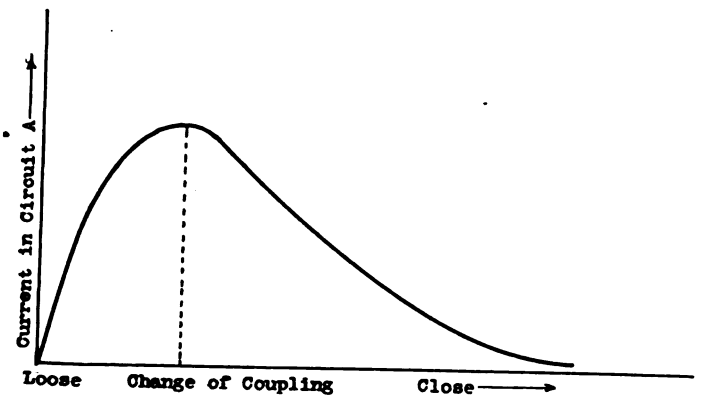

Fig. 4. Showing how, if the coupling is loosened beyond a certain point, the response of the signal suddenly decreases.

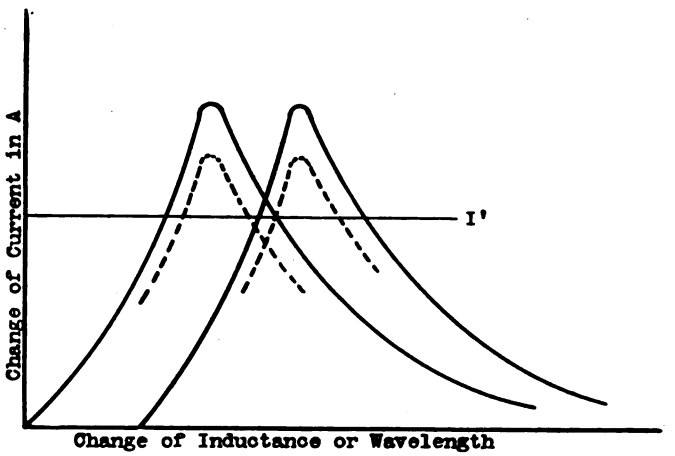

Fig. 5. Resonance curves representing two different waves corresponding to different stations sending at one time.

Seven New Broadcasters on 360 Meters

THE supplemental list of limited commercial broadcasting stations licensed during the week ending March 17 follows:

Call	Station	Power
KQP	Apple City Radio Club, Hood River, Oregon	10 watts
KFHB	Boardwell, P. L., Hood River, Oregon	10 watts
KFFV	Graceland College, Lamoni, Iowa	250 watts
KFDZ	Iverson, Harry O., Minneapolis, Minn.	5 watts
KDZQ	Pyle & Nichols, Denver Colorado	100 watts
WRAH	Read, Stanley N., Providence, R. I.	10 watts
KFDY	South Dakota State College of Agri. & Mech. Arts, Brookings, S. D.	100 watts

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A Year of Radio Progress

March, 1922, to March, 1923

March 29, 1922. First Issue of RADIO WORLD.

Second Annual Radio Show

Armstrong's super-regenerative and super-heterodyne circuits perfected. A marvelous step in the progress of super-sensitive receivers.

Photographs sent by radio from Italy to the United States. The first invention of its kind to send pictures through the ether.

KDKA First radio broadcasting station to be heard in Iquique, Chile, South America, and the first broadcasting station to establish a record distance for long distance program broadcasting.

Marconi makes a flying visit to the United States to confer with Steinmetz and other electrical and radio experts.

Dr. Irving Languir perfects a 20 kilowatt vacuum tube, the most powerful ever made.

The 1½ volt tube perfected.

First opera broadcast over the country.

Amateurs of United States and France establish communication on low waves and low power, breaking all records for distance over low wave lengths.

Dr. Lee de Forest confers with foreign scientists and perfects talking motion pictures.

World Series baseball games broadcast for the first time.

Football games broadcast over land wires and rebroadcast over radio, combing the two successfully for the first time.

National Radio Week proclaimed and celebrated—the most successful public week ever held in behalf of an industry. Big boom in the radio field.

First successful two-way communication—the annual meeting of the Westinghouse stockholders in Chicago and New York 1,000 miles apart. Perfect co-ordination was maintained through the agency of two-way communication via radio.

The White Bill, for the control of radio passed by the House and killed in the Senate.

Broadcasting stations heard and reported in both England and France, breaking all previous records for continuous program reception and transmission.

Several popular plays broadcast directly from the stage of the theatres in which they were given.

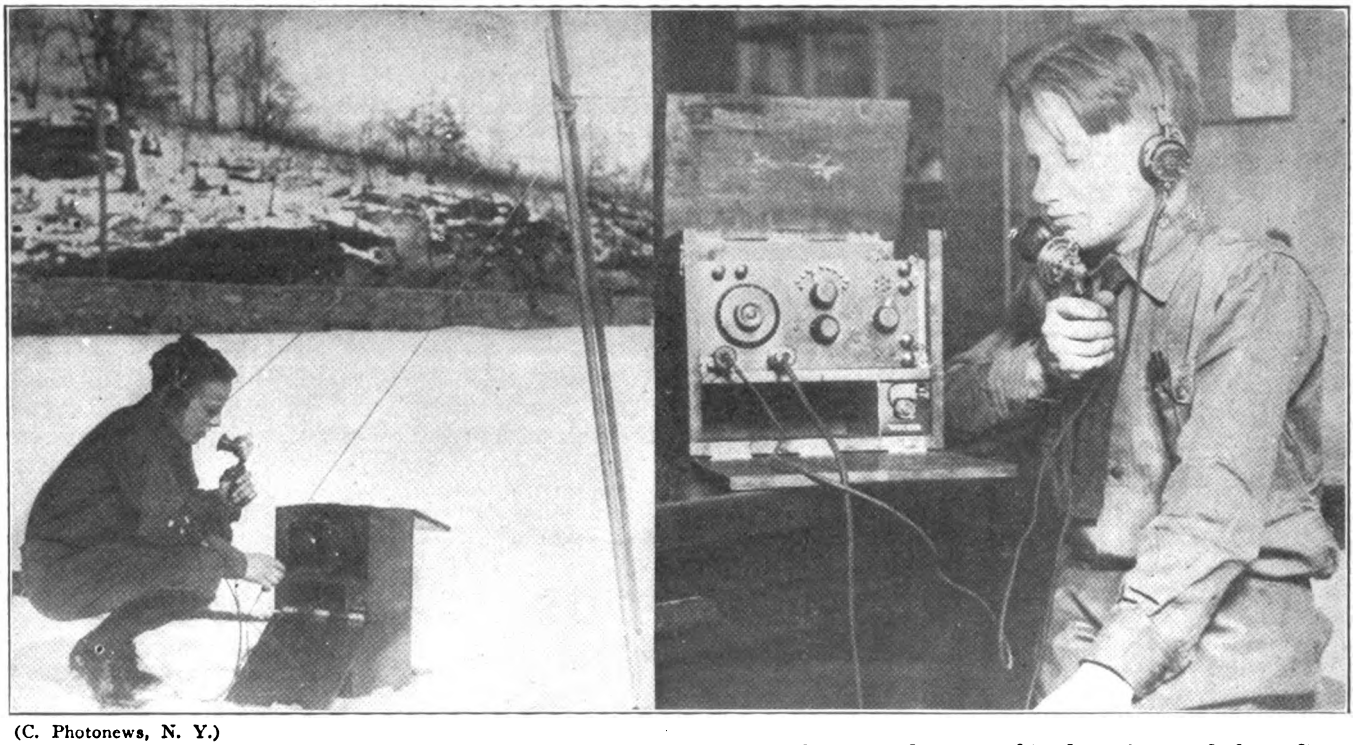
Third Annual Convention of the Second Radio District. A wonderful success.

General Harbord assumes presidency of the Radio Corporation of America.

Station at Rocky Point, Long Island, which will make the United States the center of all radio communication, brought to a point of perfection. Marks a marvelous undertaking in radio.

March, 1923, RADIO WORLD begins its second year of useful service.

Boy Scouts Active in Radio



(C. Photonews, N. Y.)

Little has been said or written about the Boy Scouts' activities in the field of radio. Nevertheless, ever since the days of 5 kw Coffins and crude galena detectors constructed out of odd pieces of material found lying around, the Boy Scouts of America have always been interested in the science.

Lately much notice has been given to the activities of the Scouts when camping out, and the illustration above shows one of the portable outfits that was built by Troop 501, of New York City.

The outfit pictured is a combined receiver and short distance transmitter, working on the same tube. It was built by the members of the troop and can be used either as a receiver or transmitter by plugging in either the receivers or the microphone. One of the illustrations shows a near view of the set, while the other depicts the set in actual operation while out on a hike, using a portable antenna which is part of the outfit. The set is self-contained, being operated on batteries carried in a separate compartment, which fits under the set proper.

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Radio Regulation in Cuba

PENDING the passage of a law to cover the use of radio telegraph in Cuba a presidential decree has been issued defining the various classes of non-governmental radio stations and prescribing certain general rules for their operation, says Acting Commercial Attaché P. L. Edwards in a report to the Department of Commerce. Up to the present time there has been no law or regulation covering the construction or operation of radio stations in Cuba.

Under the decree non-governmental radio stations are divided into five classes—A, B, C, D and E—to each of which is assigned a wave length and a maximum power. No sets of any of these classes will be used for commercial purposes. Classification is as follows:

Class	Wave length (meters)	Maximum power (kilowatts)
A*—Amateurs	200	½
B —Educational Institutions, experimenters.	225-275	½
C —Colleges, state institutions in general	300-360	½
D —State institutions only	400	½ to 1
E —Meteorological stations only	485	½ to 1

*All receiving sets are rated Class A, regardless of type or size.

All owners of stations coming within any of these five classes must register with the Director General of Communication before a stated date. After that date no station may be used unless the proper permit has been issued by the office mentioned. The permits are for a term of one year in the case of classes A, B and C, and for five years in the other two classes. Applicants must pass an elementary examination, but it is not believed that this requirement will in any way hamper the issuance of licenses. The decree further provides that the government may, under specified circumstances, require transmitting stations of any of the five classes to cease operation without claiming indemnity from the government. Transmitting stations of any class are made subject to the regulations of the International Radio Convention, signed in London in 1912. The decree also prohibits the transmitting of the international distress call, S.O.S., either as a special signal or in the course of any general text. Penalties are provided for the disclosure of any public or government message intercepted by any station. Only apparatus capable of transmitting a continuous wave may be used.

Transmission Poor

Physics Professor—"Does any one know anything about violet rays?"

Stude—"I do, but I promised not to give her away."—*Chaparral.*

RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each

Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a Rand McNally Radio Map of United States. It is complete, accurate and up-to-date.

The Rand McNally Radio Map of United States is 36x50 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover

Price 35c Each

THE COLUMBIA PRINT

1483 BROADWAY NEW YORK CITY

Radio World Begins Volume III

WITH this issue RADIO WORLD begins its second year of useful service.

It is doubtful if, in the history of the publishing business, an empty niche has been occupied with such satisfaction to readers, advertisers and the publishers as in this instance.

Our readers have demonstrated positively and concretely that they get what they want in our columns. Our volume of sales from newsstands is surprising even to us.

The increase of business secured by our advertisers has been decidedly profitable to them—and they have told us so.

RADIO WORLD will continue to give, week by week, the latest in the rapidly expanding radio field. The news will be in our columns first, and the technical development of the field will be noted by experts as it occurs.

We thank our friends for their support in our infancy, and will put forth every effort to continue to deserve it in our expanding youth.

RADIO AGENTS

Agents and small dealers wanted in every city and town to sell standard lines of radio apparatus on commission basis. Liberal compensation.

DELFELCO

18 Meeting Street Pawtucket, R. I.

Study the Morse Code

by means of a

Three-Color Flashlight

Mailed to any address in the United States and Canada on the receipt of

$1.00

Address Dept. S

C. D. Wood Electric Co.

441 Broadway New York City

PARTS PRICES SLAUGHTERED CASH WITH ORDER PARCEL POST PREPAID

$5.00 Detector Tubes, guar.	$2.75	$1.00 3-in. Hard Rubber Dial	$ .39
6.00 Amplifier Tubes	3.50	.90 V. T. Sockets	.69
6.50 Guar. 1½ Volt Tubes (detector and amplifier) for dry cells	4.95	1.50 22½ V. Cyclone B. Batteries	.79
4.75 43 Plate Variable Condenser	2.75	1.75 22½ V. Cyclone B. Batteries	1.25
1.00 Rheostat	.39	12.00 King Amplitone Loud Speaker Horns	5.75
1.50 Kloesner Vernier Rheostat	1.19	Dictograph Loud Speaker	13.50
5.50 W. D. 11 Transformer and for all dry cell tubes	4.50	3.75 Vario Couplers	1.75
4.75 Phones, 2200 ohms	3.75	7.00 All Wave Coupler, 3000 Meters	6.95
		5.00 Variometers	2.75
		1.75 3 Plate Variable Condenser	1.25
		3.75 23 Plate Variable Condenser	1.49

To avoid delays check items and total amount.

B. B. RADIO COMPANY

2202 MERMAID AVENUE BROOKLYN, N. Y.

All Deliveries Made Within Two Days

Makes Your Set Portable — SHORT-CUT ANTENNA — *Practically Eliminates code and static interference*

GOOD BYE AERIALS!

SHORT CUT ANTENNA

An ingenious device that takes the place of aerials, loops, electric light plugs, etc.

Postpaid, Anywhere, for $5.00

Satisfaction Guaranteed

SHORT CUT RADIO CORP.

243 West 54th Street, New York

Brings clearer signals and sweeter tones — SHORT-CUT ANTENNA — *Fits any standard vacuum tube set*

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Advertising Rates: Display, $5.00 per inch, $150.00 per page.

Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word.

Telephone Bryant 4796

How Radio Advertising Can Be Made to Pay

By Irving Bresalier

THOUGH radio as a science and art is a comparatively new world-wide development, touching the interests of men and women in every walk of life, the foremost consideration that should be kept in mind by those who are shouldering the responsibility of radio merchandising today is that the basic principles of marketing, no matter what industry is considered, are fundamental.

As a problem of distribution radio should be considered from no different viewpoint than any other new product which might be introduced in any older industry.

Because advertising is strongly linked with selling effort of every kind, and because this indispensable aid to distribution is now proving to be one of the most potent factors in radio merchandising, the application of our best thought and attention to this important subject will meet with due reward.

How can adverising be made to pay? No doubt every advertiser has repeatedly asked himself this question.

To begin with, advertising is not a gamble. Skilfully handled, advertising can be turned into an investment that will pay for itself over and over again in sales made and good-will gained.

Let us consider what elements or factors are fundamental to the success of an advertising campaign, with particular reference to radio.

First and foremost is the necessity of a *definite plan.* Is it desired to establish jobbers or dealers, or are direct sales to consumers sought? A definite decision in this respect is vital, as copy directed to dealers is essentially different from an appeal to consumers. Such considerations as discount schedules, exclusive agencies, etc., should be determined in a specific sales policy even before advertising is started.

In launching an advertising campaign the guiding principle should be consistent effort, as opposed to piece-meal publicity or spasmodic splurges. The constant dripping of water has been known to wear away a rock. The cumulative effect of consistent advertising will in time accomplish its purpose as effectively. In this connection it would be well to remember that "keeping everlastingly at it brings success."

Second: Efficient use must be made of advertising space. Mere capacity to buy large space in a publication is not an assurance of profitable results. The copy of an advertisement must be convincing and its presentation attractive. To attract the attention of the reader and convert his interest to buying desire calls for a thorough knowledge of advertising principles. The responsibility of filling advertising space should therefore be delegated only to one trained in publicity methods. Advertising has developed into a science—it has long ago passed out of the realm when pretty pictures and clever sayings could be depended upon to put across the sales message.

Third: Most advertisers are lulled into a sense of satisfaction upon the receipt of mere inquiries, failing to realize that, at this point, the selling task has only begun. Because of ineffective follow-up of inquiries through attractive and attention-compelling circulars, booklets, catalogues, etc., advertisers are losing their greatest opportunity to turn passing interest into profitable sales. In many cases failure to make advertising pay may be attributed rather to the indifference of the advertiser in the matter of proper follow-up than to the inefficacy of publication advertising as a sales-producing medium.

The writer of this article, upon asking a radio advertiser what results his space was producing, received the boastful reply: "Oh, we are getting a raft of inquiries." Upon asking to see the printed matter for following up these inquiries the writer was informed: "Why, we have no printed matter. All we do is to quote prices on our regular letterhead."

Think of the absurdity of the method of this advertiser! After investing a goodly sum for space practically no subsequent effort is made to capitalize the results. Of course the periodical used by this advertiser will be blamed if sufficient sales are not made to cover the advertising expenditure.

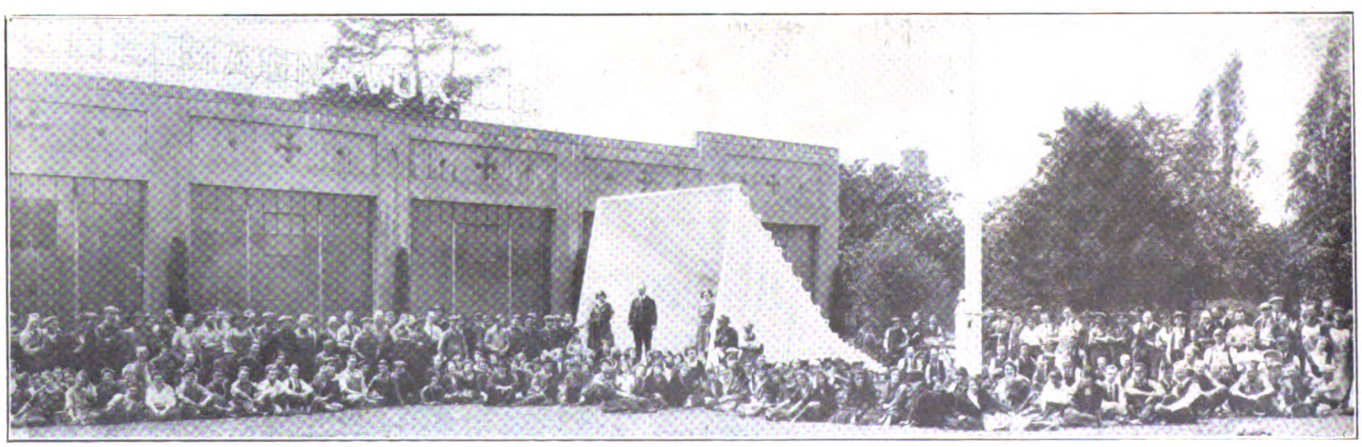
In contemplating advertising one must realize that results cannot be obtained by pursuing a hit-or-miss policy. Permanent, profitable returns can be gained only by adhering to the common-sense principles which are at the basis of all successful advertising. These, summarized, are a pre-determined, specific plan, continuity of effort and effective follow-up of inquiries. There is no reason why the spectacular results achieved through the advertising of products in other lines cannot be realized in the radio field.

Radio Renders Aid in Storm

WHEN a sleet storm which recently raged through the Middle West disabled telegraph wires, broadcasting station KYW, of the Westinghouse Electric & Manufacturing Company, at Chicago, aided news agencies, railroads and brokerage concerns in relieving the ensuing distress.

(Radio Merchandising continued on page 34)

Some of the People Who Make Magnavox for Your Sets



Group of 213 employes (count 'em!) at the Magnavox plant, Oakland, Calif., with the large super-horn designed by them and now being used in an amusement park.

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WELSH

PEANUT

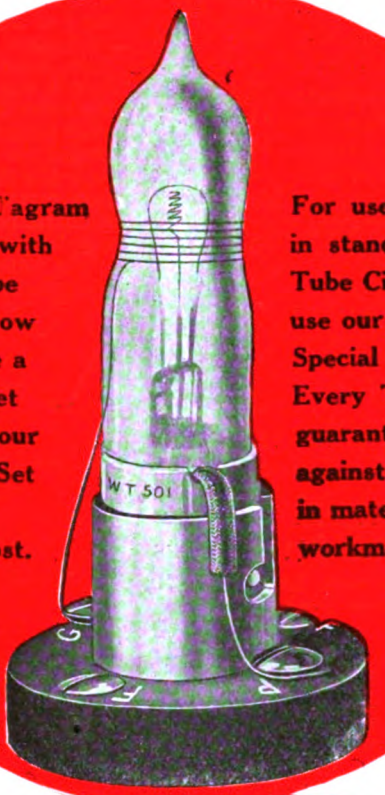
Detector Tube

W. T. 501

"The Tube That Cannot Squeal"

Immediate delivery

Wiring Diagram packed with each tube shows how to make a Tube Set out of your Crystal Set at very small cost.



For use in standard Tube Circuits, use our Special Adaptor. Every Tube guaranteed against defects in material and workmanship.

List Price Only

2.00

If not at your dealers send us his name and address and money order for sample.

Nickel plated socket, moulded base, double spring contacts, 40c. extra Adaptor for standard V. T. Sockets, 75c. extra

Filament current is less than .5 amperes at 4-6 volts. Plate voltage 16-22½

JOBBERS AND DEALERS

Wire for our special proposition.

RADIO RESEARCH GUILD

40 Clinton Street, Newark, N. J.

Use scissors here and mail today

Radio Research Guild, 40 Clinton Street, Newark, N. J.

Please send ..... Welsh Peanut Tubes W.T. 501 ..... Sockets

Enclosed find $..... Adaptors

Name .....

Address .....

City ..... State .....

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Radio Merchandising

(*Continued from page 32*)

Radio Stocks

(*Quotations as of March 21, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York, Specialists in Wireless Securities.*)

Stock	Bid	Asked
American Marconi, Stamped..	5*	15*
American Marconi, Unstamped	5	7
American Tel. & Tel.....	122½	123
Canadian Marconi	2½	3½
De Forest Radio.....	7	10
Dubilier Condenser	8½	8¾
English Marconi com.....	11	15
English Marconi pfd.....	11½	15½
Federal Tel., Cal.....	5¼	5¾
General Electric	185½	186
Hennessy Radio Pub. Corp. pfd.	9	11
Mackay Co. com.....	113	115
Manhattan Elec. Supply.....	61	62
Marconi Int. Marine.....	8	10
Radio Corporation com.....	4¼	4½
Radio Corporation pfd.....	3⅜	3½
Spanish Marconi	1	3
Western Union	115	115½
Westinghouse Elec.	64½	65

*Cents per share.

A Help for Reflex Set Builders

Manufactured by Jaynxon Laboratory, 57 Dey Street, New York City

A SYNTHETIC crystal recently brought out by the Jaynxon Laboratory will evidently meet with a great demand by the makers of reflex sets, as well as convert quite a few of the tube users back to crystals for a while. It is a gray composition, resembling lava in appearance. It is equally sensitive over a large surface, and is therefore much to be desired by those who intend to utilize crystal detection in the use of radio frequency or reflex sets. The name of the crystal itself is Reflex, and it therefore suggests that use for the crystal. The fact that it is so extremely sensitive over such a large surface, and under test is practically "unknockoutable," should make it very popular.

The Filkostat Assists Fine Tuning

MR. S. R. HIPPLE, well known for his inventions in the field of electric current control, has devised an instrument called the "Filkostat," designed to utilize the great tuning possibilities of the vacuum tube itself. The Filkostat permits perfect regulation of filament heat, an essential to perfect tuning. The extreme degree of fineness in increase and decrease of electronic flow by infinitesimal gradations makes the Filkostat control ideal and adds to the life of the tube.

This new instrument is claimed to be non-microphonic, absolutely silent and free from all noises, due to perfection of design and ample internal contact. It has other valuable advantages of great interest to amateur radio-set builders, as well as manufacturers. The DX Instrument Company, Harrisburg, Pa., are manufacturing the Filkostat, and its international distribution is in the hands of the Radio Stores Corporation, New York City.

A Compelling Window Display for Radio Dealers

By Arthur G. Shirt

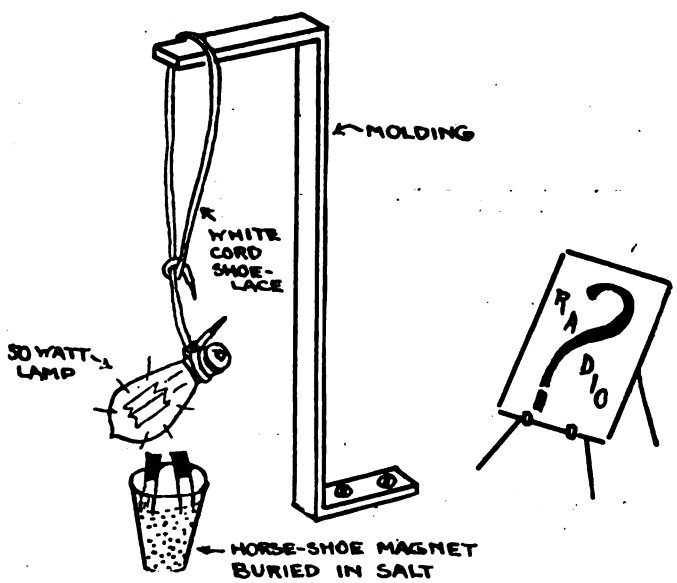
A NOVEL and interest-compelling window device has been used recently by Doughty & Welch, electrical contractors, Fall River, Mass., to call attention to their side-line of radio apparatus. In the very center of their display window, and isolated from the other exhibits, stood an angle stand of wood molding, and from the molding hung a 50-watt electric lamp. Although there were no visible connections to the light it was burning very brightly. Underneath the lamp was a tumbler full of salt, while buried in the salt with its poles turned toward the light was a horse-shoe magnet. How the electricity got to the lamp was a deep mystery, for it was hung from the standard, not by wires, but by a white cord shoe-lace.

The interest taken by the public in this mysterious device more than repaid the trouble taken in making it up. While the crowds outside the window wondered Messrs. Doughty and Welch brought their radio message before them by placing a card in the window with a big red question mark prominently displayed. On the card was printed also the word *"Radio."*

"Well, it might be," thought the throng outside, "and then again it might not." Probably one out of every twenty went inside the store to find out, and while they were in there they incidentally were introduced to a high-grade line of radio goods. Curiosity may have killed the cat, but it had no damaging effect on the trade of Doughty & Welch.

The secret of the whole device, of course, lies in the clever concealment of the wires leading to the lamp. They come along the floor of the window under the plush or velvet covering and enter the molding from the bottom. They are run up the molding, and both come out into the shoe-lace, so that, although the shoe-lace looks as if it were casually thrown over the standard, it is really fastened there by the wires. One wire goes down to the lamp through one side of the shoe-lace and is soldered on to the shell of the 50-watt lamp. The other wire travels down the other side of the shoe-lace, goes through a hole drilled in the shell and is soldered to the center contact. All this, of course, is carefully done and also carefully insulated so as to prevent short-circuiting. The connections to the base of the lamp are concealed by the wrappings of the shoe-lace around the shell.

The tumbler of salt and the magnet have nothing to do with the device at all. They are placed in a position under the lamp to increase the mystery and possibly to divert the scrutiny of the public from the true explanation. The sign with the big question mark suggests that radio might be responsible, and so calls attention in a novel way to the remainder of the window display, which, of course, is made up of radio apparatus of popular appeal.



Radio Dealer's Window Display Which Is Sure to Attract Attention

New Radio Firms

(*The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addreses are given whenever possible.*)

Thermoflasher Corp., Syracuse, N. Y., electrical novelties, $15,000; H. N. Frances, F. L. Robbins, C. F. McKay. (Attorneys, Higbie & Malpass, Syracuse.)

Pittsburg Generator Co., McKeesport, Pa., increase of capital from $300,000 to $5,000,000.

Radio Reynolds, New York City, $10,000; B. Reynolds, M. Klein, A. Werner. (Attorney, J. Klein, 152 West 42d St.)

Park Place Radio Electric Company, New York City, $20,000; S. S. Goldstein, M. Heberman, P. R. Steigleman. (Attorneys, Janover & Janover, 30 Church Street.)

Radio Insulate Corp., New York City, transmitting apparatus, $200,000. (U. S. Corporation Co.)

Simplex Radio Corp. and Electrical Supply Co., stocks and bonds, $100,000; Alfonso Berrico, Attilio Derrigo, Robert I. Torone, Boston, Mass. (Corporation Service Co.)

New Era Electric Corp., New York City, $1,500,000. (U. S. Corporation Co.)

Utica Battery and Electric Co., Utica, N. Y., $25,000; H. Rosenmeyer, R. H. Vaughan, H. Meehan. (Attorney, F. J. McEwen, 70 Broadway.)

Nodens, Brooklyn, N. Y., make electric supplies, $25,000; A. and V. A. Noden. (Attorney, B. H. Noden, 115 Broadway, New York City.)

Hall Electric Corp., Kenmore, Erie County, N. Y., $10,000; C. E. and P. B. and R. V. Hall. (Attorneys, Wilcox & Van Allen, Buffalo, N. Y.)

Radio Construction Co., Delaware, 500 shares preferred stock, $100 each; 7,000 common, no par value; rep., H. H. West, 15 West 44th St., New York City.

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New Records of The DX Nite Owls

Working Overtime for These

From J. E. Bradley, Justin, Tex.

I WANT to submit to the DX Nite Owls my February report. Worked 107 hours 24 minutes; total stations, 449. Now this doesn't count any station within 100 miles. Days worked, 26 (missed two). 105 different stations, 102 in U. S. A., in 29 different states, 1 in Canada and 1 in Cuba, viz.: WCM, WOAI, WLAL, KLZ, KFAF, WDAF, WHB, KSD, WOS, WHAS, WIAR, WGM, WSB, WDAJ, WOI, WOC, KHJ, WAAZ, WWJ, WDAP, WEAY, WKY, WJAN, WFAV, WFAT, KNJ, WMAB, WEAZ, WPAC, WOAL, WCAH, WKAL, WLAG, WIAO, WBL, WCX, KYW, WLW, KFI, WLK, PWX, WTAW, WOAA, KWH, WHA, WOAK, WOAZ, WHAN, KOB, 5YQ, WMAJ, WAAP, WGY, WMC, WSY, KDKA, WCAZ, WRAM, WKAC, KZN, WOAN, WWAX, WMAT, WJAP, WGV, KDZQ, WJAX, WCAL, WJD, KGW, WQAQ, KFDL, 9DHB, 5ADO, WLAZ, WCAR, WGF, WPAH, WIAS, WMAV, KDPT, WPAS, WCAJ, KFFQ, KDYS, WMAQ, WMAK, KFAP, WPAK, KFHJ, WOR, WCAZ, WLAS, WJZ, WCAS, WAAN, KFBK, WGAT, KUO, WUD, WBT, WPE, WJAQ, WHAB, CHBC.

I would like to hear from some DX'ers with two-tube sets. Mine is a two-tube (WD-11) short wave regenerative, consisting of two-tubes and sockets, Grid leak and condenser, phone condenser, two rheostats, one variometer, two condensers and one transformer. I thank you for devoting part of your good magazine to us DX'ers.

* * *

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

Cuba, Hawaii, Porto Rica and ships. I have a two step and Magnavox. I have a little crystal set, and have heard KDKA, WJS, WWJ, WOC, WHAS, and February 21 I heard a station in Kansas during WPAL. I only use my crystal set when I am getting my battery charged.

* * *

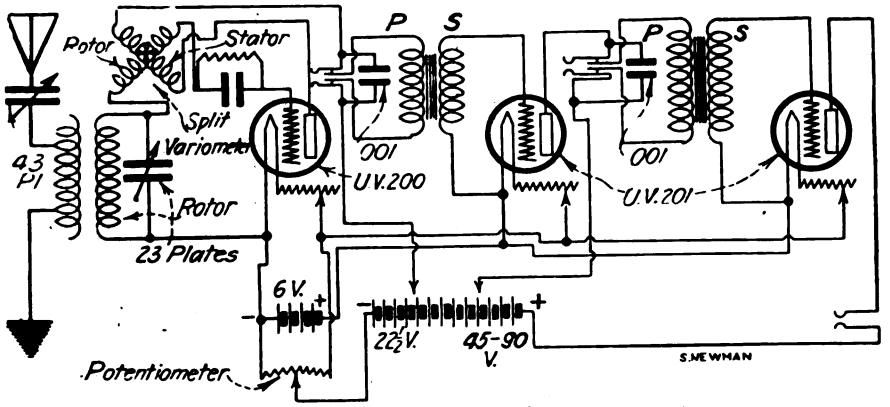
A New One from a DX'r to the Bunch!

From Earl E. Gibbins, Room 217, Dexter Bldg., Springfield, Mass.

ENCLOSED you will find a simple but very effective circuit with which I am receiving the United States, Canada, Cuba, and all the others worth mentioning.

After reading your magazine regularly and noticing the DX results I feel that my circuit is worth of mention and will give the Nite Owls something to shoot at, even if it should pass over their heads.

It is an original idea of my own, after plenty of experimental work, and I am sure that it is the equal of any if not superior to most of them for bringing the DX.



Circuit used by Mr. Earl E. Gibbins, and one that will suggest some improvements to you DXrs. Note the fact that he uses a split variometer, which, although not a new idea, is original, and that is what counts.

I have varied the original circuit and use a split variometer which I believe makes it different from any other circuit that has heretofore been published. I will be glad to furnish any additional data upon request, if a stamped self-addressed envelope is enclosed for reply.

If any "Nite Owls" can suggest any improvements on this, I will be glad to "get together" with them.

* * *

Uses Home-Made Spider Web

From Joe Colborn, Memphis, Tenn.

I AM very much interested in the "DX Nite Owls" as published in RADIO WORLD. I am sending in my record:

WDAJ, WHB, KDKA, WBAP, WSB, WLAG, WLW, KSD, WOC, WAAL, WJAK, WFAA, WWJ, WDAF, WGY, WCX, WBT, KFAF, WHAS, WOAI, WOR, PWX.

I am using home-made, spider web coils and WD-11 tube without amplification.

* * *

From a Young Buckeye

From Ralph Mallory, Columbus, Ohio.

I HAVE been reading your DX Nite Owls' records and decided to send mine in. I am thirteen years old. On February 15 about one hour and fifteen minutes. The stations are as follows: KDKA, WIAO, WOR, WOO, WHA, WOC, WDAP, WIAR, WGY, WMAQ, and WDAJ through WEAO. I have heard stations throughout the country, including Canada,

Hot Dawg! Let's Step!

From C. W. Hallowell, Susanville, Calif.

The writer was discussing the article on Radio Golf which appeared in your magazine under date of Feb. 3d, with the "Old Man" of our local radio colony here, Mr. H. B. Pearce, who stated that he was of the opinion that this record could be broken and on the evening of Feb. 13th proceeded to do so.

We are, therefore, submitting attached a list of the stations which he received and practically in the order in which they came in. Considering that all stations East of California have to be brought through some of the powerful California stations which are on early in the evening, we were at a serious disadvantage compared with persons situated in the Mississippi Valley or even on the Atlantic coast, and under the circumstances feel that a record of about 7,000 miles per hour will give the boys something to shoot at for a few days.

The set which was used was a British Radio-Frequency Tuned-Plate Reactance Type Receiver which was built by Mr. Pearce, Mr. George Harrison and the writer.

5:00 to 10:25 P. M. Pacific standard time. WGY, Schenectady, N. Y., 2,502 miles; WJZ, Newark, N. J., 2,516; WHAS, Louisville, Ky., 1,941; WAAS, Decatur, Ga., 1,950; WCOE, Pittsburgh, Pa., 2,221; KGG, Portland, Ore., 381; KUO, San Francisco, Calif., 226; KWH, Los Angeles, Calif., 474; KMO, Tacoma, Wash., 503; WWJ, Detroit, Mich., 2,027; KFBK, Sacramento, Calif., 137; KDYL, Salt Lake City, Utah, 482; WHA, Madison, Wis., 1,680; KHJ, Los Angeles, Calif., 474; KZM, Oakland, Calif., 216; KZN, Salt Lake City, Utah, 482; KLZ, Denver, Colo., 863; KLX, Oakland, Calif., 216; KFV, Yakima, Wash., 446; KFAF, Denver, Colo., 863; WBAY, New York, N. Y., 2,530; WBAP, Fort Worth, Texas, 1,445; WCX, Detroit, Mich., 2,027; CFCN, Calgary, Canada, 866; KJS, Los Angeles, Calif., 474; WDAP, Chicago, Ill., 1,783; KDPT, San Diego, Calif., 589; KMJ, Fresno, Calif., 309; KFAN, Moscow, Idaho, 489; KGB, Tacoma, Wash., 503; KFEL, Denver, Colo., 863; KWG, Stockton, Calif., 180; KPO, San Francisco, Calif., 226; WLW, Cincinnati, Ohio, 1,991; KGY, Lacey, Wash., 475; KFAT, Eugene, Ore., 180; KFHJ, Santa Barbara, Calif., 350; WFAA, Dallas, Texas, 1,481; WDAF, Kansas City, Mo., 1,445 miles. Total, 38,806 miles.

* * *

Come Along, Owls!

From Fred Temby, Bloomingdale, N. J.

FOLLOWING are the stations I received using a single-circuit, feed-back set and one W-D 11 tube:

2XY (testing), WJZ, WOR, WSB, WBS, WRW, WOI, WIP, WFI, WLW, WBZ, KOP, KYW, WMH, WGI, WGY, WRK, WWJ, WQC, WBAY, WCAN, WNAC, WBAP, WKAA, KDKA, WCAE, WAAM, WHAS, WBAN, WGAM, WGM, WST, WBAZ, WAAP, WHAZ, WGF, WOO, WCZ, WMAM, WMAQ, WAAW, WMZ, WAID, WLAC, WJAX, WWI, WHAM, KSD, WBT, CHYC, WBAP, PWX.

These stations came in clear, and I am sure of every one. I received several of which I am not sure, and which I have not marked. These were received in less than two months.

* * *

Come Along, You Cotton Planters!

From D. M. Dunbar, Box 641, Cotton Plant, Arkansas

I HAVE a few DX remarks to make. I built a receiver by the directions of Ortheus Gordon in Jan. 20th issue of RADIO WORLD, using Kellogg 43 condenser, De Forrest 50 and 75 H. C. coils, Na-ald socket, Freshman variable grid leak and condenser. When completed this circuit brought in the following places all clear and fine: WOC, WHB, WOAI, KSD, WDAP, WDAJ, WSB, WOS, WDAF, KFAF, WBAP, WLAG, WMC, WCX, WHAS, WSY, WKY, KWH, KFI, WAAP, WLK, WLW, WBL, WHA, WGAY, and last of all I have had WGY five times straight running.

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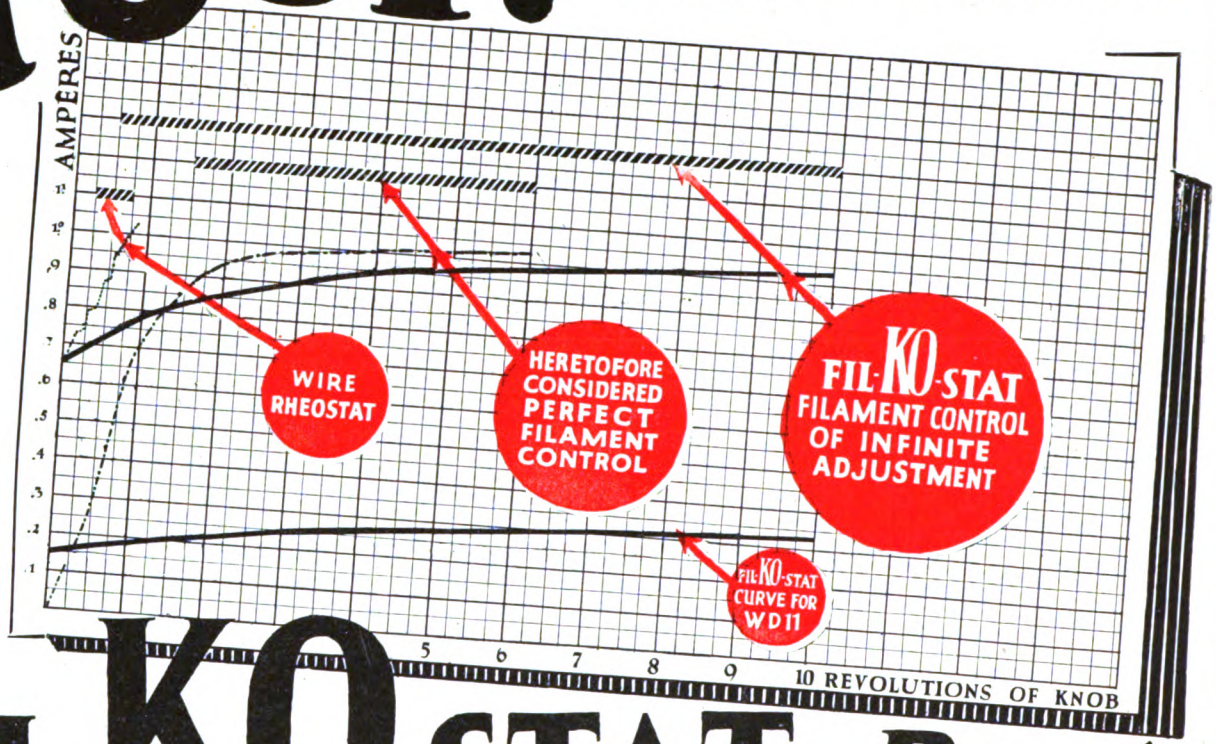
Proof!

Graphic proof of FIL-KO-STAT superiority as shown here can be had in any laboratory equipped with Bureau of Standards Instruments.

Practical proof of FIL-KO-STAT superiority is evident the moment you put FIL-KO-STATS in place of the devices you now use to regulate filament action.

Here's the Comparison of Fine Adjustment Control Range of FIL-KO-STAT with Rheostats and Other Filament Controls Clearly Indicating How FIL-KO-STAT Excels and Showing Wherein it Permits Perfect and Gradual Current Increase With Infinite Adjusments



FIL-KO-STAT *Best* Filament Control

The filament kontrol of infinite adjustment
FIL-KO-STAT
CURRENT INCREASE PERFECT AND GRADUAL
LIKE THE RISING SUN
Trade Mark Registered

Infinitesimal Control
of Electronic Flow

Definite Off
indicating complete "A" Battery disconnection.

Fine Adjustment
starts where tube *begins* to function.

At Full On
Resistance practically zero.

Absolutely Silent
Non-michrophonic, free of all noises.

No Current Variations
Resistance constant at any setting.

No Disks to Break or Chip
Resistance element so finely divided further division impossible.

GUARANTEED

The FIL-KO-STAT is to all purposes "fool proof". Each instrument is packed with the maker's guarantee that it will be replaced if broken within one year.

Manufactured by
DX INSTRUMENT Co
HARRISBURG PA.

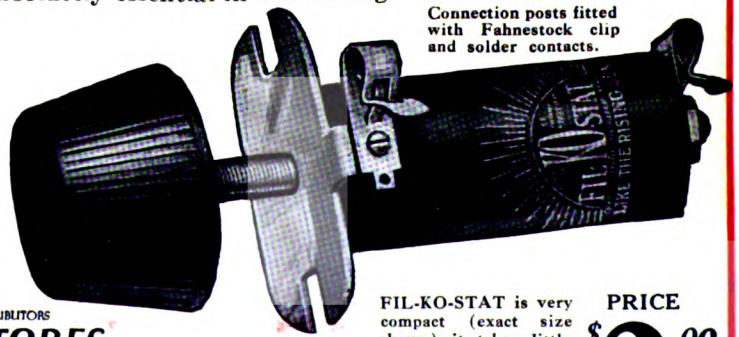
You have been eagerly waiting for just this instrument Mr. Set Builder, amateur or manufacturer. It marks a step forward in Radio. It is not an adaptation of some old method of current control. It is not a rheostat. IT IS A FILAMENT CONTROL, distinctly designed to utilize the great tuning posibilities of the vacuum tube itself.

Its superiority is proven by every test. It regulates the FILAMENT HEAT. It gives absolute control of the ELECTRONIC FLOW and consequently permits THE FINEST TUNING POSSIBLE.

Perfect and gradual increase of filament heat assures longer life to the tube. Fine adjustment of fractional currents makes it ideal for use with Dry Cell tubes.

And infinitesimal control of electronic flow gives a corresponding control of fine detection so absolutely essential in DX tuning.

The time to replace all other filament control devices with FIL-KO-STATS is *now*. Say "FIL-KO-STAT" to your dealer today. If he has none in stock send his name and your remittance direct to



Connection posts fitted with Fahnestock clip and solder contacts.

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RADIO STORES CORPORATION
218-222 West 34th St.
Dept. R.W. NEW YORK

WIRE ORDERS FILLED TO JOBBERS AND DEALERS

FIL-KO-STAT is very compact (exact size shown) it takes little space on the panel. So mountable it can replace any other control without redrilling.

PRICE $2.00

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"Of all the innumerable crystal sets, none can even remotely compare with the NATIONAL AIRPHONE"

DR. H. BORDEN CLARKE & CO.
Largest Wholesale Radio Service in Eastern Canada
CLARKE BUILDING
1034-38 Barrington St.

NATIONAL AIRPHONE CORPORATION,
New York City, U. S. A.

Halifax, Canada, February 5, 1923.

Gentlemen:

I wrote you some time ago that we intended testing out your National Airphone Crystal Set for long distance work.

The splendid results allow me the pleasure of informing you that your modest claim of Distance Range is altogether too conservative.

Together with several responsible friends I am willing to testify before any legal agent that we have received complete, concise, clear and natural programs from WGY, New York, Newark, N. J., and Philadelphia Pa.—besides two other unknown stations of long distance.

Our aerial is the average 100 foot one, our office location is very low indeed, near the harbor shore.

Further, slipping your compact little set into my hunting jacket pocket I recently went back in the hills to my camp, hunting; throwing a short wire over a pine tree and in the cabin window. I received that evening two Halifax stations and WGY very clearly. (Halifax, N. S., is about 800 miles northeast of the nearest station mentioned herein.)

Of all the many innumerable Crystal sample sets sent me for testing, none can EVEN REMOTELY COMPARE WITH THE NATIONAL AIRPHONE: WORKMANSHIP, APPEARANCE, POWER, RANGE and COMPACTESS PLACE IT FAR ABOVE ALL.

Yours very sincerely,
(Signed) H. B. CLARKE.

HBC/ED

READ THE TESTS

NATIONAL AIRPHONE CORPORATION,
16 Hudson Street,
New York, N. Y.

Ridley Park, Pa., December 28, 1923.

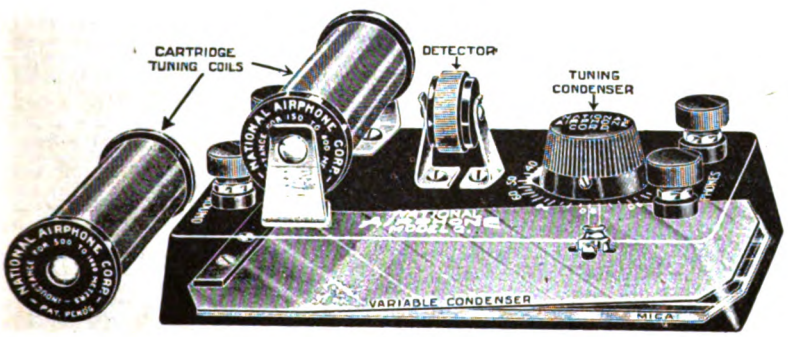
Gentlemen:

Received the two Gold Grain Detectors shipped on the 23rd, and put one in a set using three stages of radio frequency amplification and two audio employing three tubes.

It may interest you to know that I actually got 50% better results as regards distances received with your detector than with a tube and there was no comparison as regards quality of music inasmuch as the parisitic noises generated in the Vacuum Tube when used as a detector were absent. In fact I got less noise of an objectionable character with three stages of audio frequency after your detector than I do with two after a tube detector.

Last night I listened to Havana, Atlanta, Pittsburgh and Davenport without changing the setting of the detector and what is more remarkable is the fact that even with three steps of radio ahead of your detector the powerful currents generated from receiving WFI and WIP (not 10 miles away) were not sufficient to destroy the sensitivity of this remarkable piece of apparatus.

Yours very truly,
(Signed) J. R. BAISLEY.



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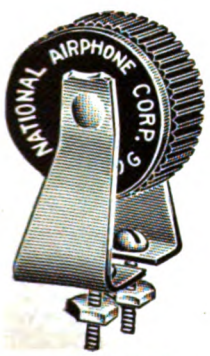
MODEL G

The most practical radio set ever made. It is so simple that you need know nothing of radio to operate it. Even a child can get perfect results. No unnecessary complications of any sort. Nothing to fuss with, no batteries, no tubes. No time lost in making adjustments. Just turn the knob and listen. No cost of upkeep or maintenance of any kind.

Complete as shown with 2 Interchangeable Inductance Coils $12.50

Reproduces voice and music in natural color and tone without distortion



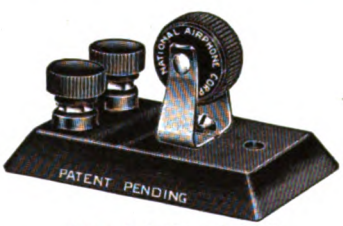
(Actual Size)

"GOLD GRAIN" DETECTOR
For Panel Mounting

$2.00

Can be fitted to any radio receiving set. A revelation to users.

"PUTS THE JOY IN RADIO"



(Size 2 1-16′ x 3 1-4″)

"GOLD GRAIN" DETECTOR

Mounted on base with two binding posts..... $2.50

We are the originators and sole manufacturers of the super-sensitive, semi-automatic "Gold-Grain" Detector, the highest development in Tubeless reception. This Detector consists of an air and moisture proof cartridge, hermetically sealed, in which is enclosed the contact element of pure gold. Has no catwhisker, eliminates hunting for sensitive spots. Simply turn the knurled cylinder and tap lightly with the finger. New contacts are established instantaneously. It gives the clearest and loudest reproduction of all sounds without distortion.

TRADE MARK **NATIONAL AIRPHONE CORPORATION** REG. U.S. PAT. OFF.

W. 16 HUDSON STREET, NEW YORK, N. Y.

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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SUPER RADIO FREQUENCY transformers and Super Tuning units. Something new. Write. Radio Experimenters Service, 727 Bates St., Detroit, Michigan.

FOR QUICK SALE—Variometer regenerative receiver, detector unit, phones and tube. Only $32.50. New. 9AVO, 746 South Armstrong, Kokomo, Indiana.

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SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

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CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

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Address Wanted:—The address of Arthur Kimberling. Write Business Dept., Radio World, 1493 Broadway, New York City.

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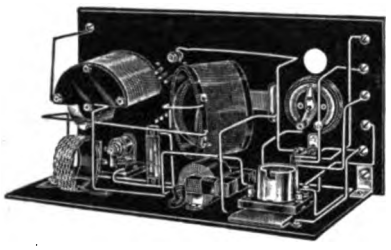

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Make One Tube Do the Work of Two

The

PERFECT RECEIVER

One Tube Reflex

Endorsed by the New York Evening Mail

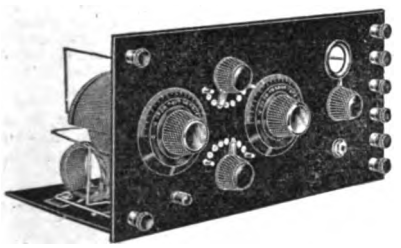
UNASSEMBLED

PARTS CONSIST OF THE FOLLOWING:

- One Super Sensitive Crystal
- One Crystal Detector
- One WD-11 VT Socket
- 20 Feet of Buss Wire
- One 7x14x3/16 Formica Panel (Drilled)
- Eight Marked Binding Posts
- Two 2-in. Pathe Dials
- 14 Switch Points
- 2 Switch Levers
- Four Stops
- One Rheostat
- One Double Circuit Jack
- One DL Honeycomb Coil No. 50
- One 43 Plate Condenser
- 180 Degree Variocoupler
- One Audio Transformer
- Two .002 Mica Condensers

Total

$17.50



TRANSFORMERS

Federal RF with mount	$8.00
WD-12	3.50
Amertran	5.50
DeForest	3.00
Creco	2.45

CONDENSERS

Aetaco 43 Plate	$1.75
Aetaco 23 Plate	1.35
Aetaco 11 Plate	1.00
Aetaco 3 Plate	.80

POTENTIOMETERS

Federal	$9.85
Framingham	1.10
General Radio	2.45

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Federal	$9.80
Cutler-Hammer	.75
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Rheostat with nickel dial	.50
Fada Type	.50

PHONES

Baldwin Phones Type C	$8.00
Western Electric	8.50
Kellogg	6.00
Federal	4.50
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Reinartz Coils with Diagram	1.50

MAIL ORDERS ARE OUR SPECIALTY

American Radio Stores

235 Fulton Street, New York City

All orders must include postage, and all checks must be certified.

Moving Pictures by Radio Predicted by Jenkins

THE American family will be able, in the near future, to gather about the radio set in the parlor and see a complete moving picture show. This is the confident prediction of C. Francis Jenkins, inventor, who is putting the finishing touches at his laboratory in Washington, D. C., on apparatus for transmitting and receiving moving pictures.

Mr. Jenkins recently startled the radio-fascinated public by the transmission of photographs of Harding, Coolidge and other notables from Washington to Philadelphia, the first long-distance transmission of photographs by radio ever accomplished. This device was illustrated and described in RADIO WORLD for March 17, 1923.

"I will have my apparatus ready for a trial within a very short while," Mr. Jenkins is quoted as saying. "I have nearly finished it, and am absolutely confident that the experiment will be successful. There is nothing in the way of transmission of moving pictures but a matter of speed, and I am sure I can provide for that."

Hammond Sells 200 Radio Patents

RADIO devices developed by John Hays Hammond, Jr., primarily for war-time use by the government, which include methods of operating aerial and marine torpedoes and maneuvring battleships without personnel for target practice, have been sold, it was announced in Washington, D. C., last week, to the Radio Corporation of America and the American Telephone & Telegraph Company.

The government, however, will retain an option on all of the devices for military use and for experimentation with aircraft bombing. Mr. Hammond and his assistants will be retained as consulting engineers by the Radio Corporation. Approximately 200 separate patents have been conveyed to the commercial companies in the transaction.

Parts to Make Up

FLEWELLING CIRCUIT

No ground, no aerial. Portable; can be carried in your car, train or camp. Will get long distance on a loop.

Simple to operate; can be worked with W. D. 11 Tube.

1 Spec. Bakel. Variocoupler	$2.90
1 .0005 finest Vernier condenser	4.35
1 Socket (genuine condensite)	.60
1 Rheostat (the best obtainable)	1.00
3 .006 Condensers (mica Dubilliers)	2.25
1 Grid Leak (cartridge type) and holder	.90
1 Freshman Var. Leak and Condenser	.90
1 Bakelite Dial for Variocoupler	.25
1 Inductance Switch	.85
5 Lengths Buss Wire	.30
2 Lengths Spaghetti	.16
8 Binding Posts	.40
1 Genuine Bakelite Panel, 7"x18"	2.25
Finest make 7x18 Cabinet	3.75

WE SELL:

45 V. "B" Batteries (each)	$2.25
6 V. 60 Amp. Marko's Battery	9.50
U. V. 200 Tubes	3.95
U. V. 201 Tubes	5.50
U. V. 201A Tubes	6.50
Nathaniel Baldwin Type C, Double Phones	6.50
Nathaniel Baldwin Type C, Single Phones	4.50
Brandes (Superior) Phones	5.95

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THIS reduction is for the United States only and went into effect Feb. 28th.

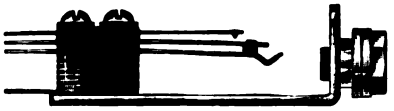
The New Prices Are:

The Saturn Automatic Radio Plug

The Plug with the RED SEAL

$1.25

The Saturn "PERFECT" Jack



No. 1. Single Circuit, Open....$0.50
No. 2. Single Circuit, Closed.. 0.55
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Cut exactly to size and shipped within 12 hours. ¼ inch thick, 1½c per square inch, 3/16 inch, 1¾c per square inch. Made of the highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable, easy to work and takes a nice finish. Special offer, 6x6x¼, 50c; 6x12x¼, $1.00. Postage paid.

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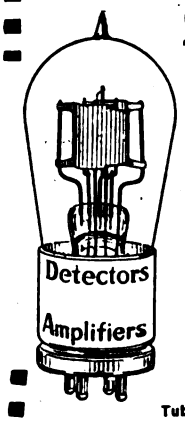

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VACUUM TUBES

W.D.-11 not accepted for repair

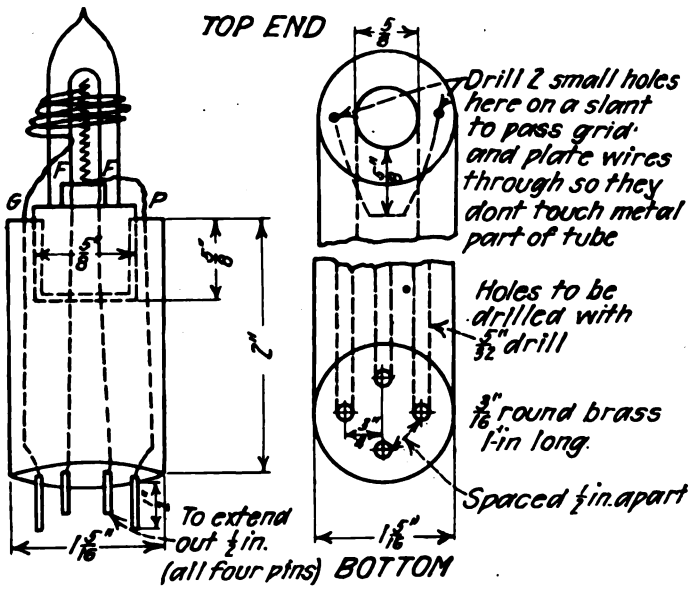
Your dealer should know, but if he does not, send direct to

HARVARD RADIO LABORATORIES
Boston 9, Mass.

Tubes returned Parcel Post C. O. D.

Making a Socket Adapter for a Peanut Tube

By P. F. Metzler


TOP END
F
F
G
P
5/8
1 1/16"
To extend out 1/4 in. (all four pins)
BOTTOM
5/8
Drill 2 small holes here on a slant to pass grid and plate wires through so they dont touch metal part of tube
Holes to be drilled with 5/32" drill
3/16" round brass 1-in long.
Spaced 1/4 in. apart
1 1/16"

SOCKET adapters for W. T. 501 peanut tubes are scarce and hard to get, so it's up to the amateurs to make them for themselves. The one herewith described will be found to be very satisfactory, as it can be shifted from one socket to another without disconnecting any wires or running the risk of breaking the lead from the grid or plate.

The sketches show all details of making this adapter. No. 1 gives a general outline as it appears when finished. No. 2 shows the top view, and No. 3 shows the bottom view where the four brass pins are placed. The pins are made out of 3-16 round brass, one inch long, slightly rounded.

You will also have to get a round wood piece two inches long and 1 5-16 inches in diameter. In this drill a hole on one end ⅝ in diameter and ⅝ deep. On the other end drill four holes with a 5-32 drill all the way through into the ⅝ hole. Then on top on each side of the ⅝ hole drill two more small holes so that they will come out at bottom of ⅝ hole. These are for the grid and plate series. Next, solder onto the tube four fine wires leading from the grid, plate and filament contacts. These go through the four 5-32 holes.

Next, drive in the brass pins ½ inch. Solder the four wires to these as close to the base as possible. Have a socket handy and make the pins correspond with the grid, plate and filament. Be very careful about this, as you may burn out a tube if you place it in the socket incorrectly.

Next, drive a small pin in the side to hold it in the socket. You might place the adapters in the socket in the right place and press down slightly. Mark with a pencil where the pin belongs. A real small nail cut off about ⅜ inch long will answer, using the point end.

WALCON
Radio Frequency Transformers

Brings in distant stations on a loop—perfect reproduction. No distortion. Awarded Certificate of Excellence by N. Y. Eve. Mail.

THE BEST YOU CAN BUY

WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.-11 tubes.

Four new hook-ups, including a new reflex circuit furnished without charge with each transformer.

Price, $4.00. We pay postage.

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THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tips—Universal Current
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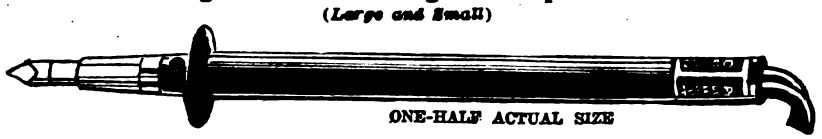

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$6.00

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Broadcasting Stations Can Not Send Personal News

BROADCASTING stations receive requests almost daily to send out messages of a personal character. One man requested WGY to send a description of his Airedale pup which was lost and greatly missed by his children. Another asked that the waiting world be informed that his family was well.

Those who make requests for the broadcasting of purely personal matters are informed that the stations are not permitted, under their licenses issued by the United States Department of Commerce, to put anything into the air that might be interpreted as a personal or commercial communication.

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FOUR DAY SERVICE
6 V. Detectors, $2.56; Amplifiers, $2.75;
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Complete instructions and diagram, $1.00
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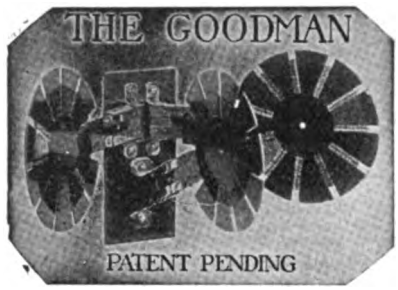

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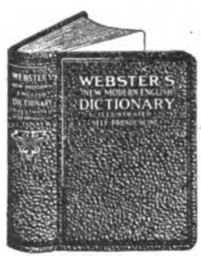

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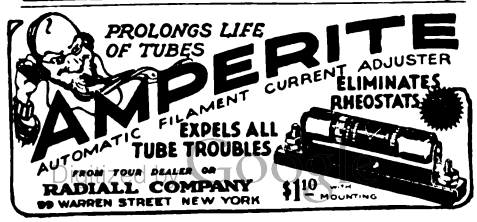

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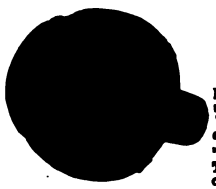
$2.00



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This adapter is constructed of molded composition. It eliminates metallic and distorted sounds. Guaranteed to be satisfactory or money refunded.

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Original
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FREE
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Phones can be used as head set or on speaker. Combination makes a wonderful loud speaker.

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THIS IS THE SET YOU'VE WANTED
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6 Volt Detector Tube	4.00	2.25
6 Volt Amplifier Tube	4.50	2.75
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Rapco WD-11 Transformers	5.00	3.95
Clod Two-Way Plugs	1.00	.75
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Workrite Variometer	3.50	2.99
Workrite Variocoupler	3.50	2.99
Workrite Headphones	8.50	7.00
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Wireless Installations Barred in China

NEWS, said to be from an official source, was sent out from Washington, D. C., last week announcing that the government of China has refused the application of the Westinghouse Electric International Corporation for permission to import radio materials into China and to establish broadcasting and receiving stations.

Permission was refused by the Chinese Minister of War, it was asserted, on the ground that radio apparatus is contraband of war and therefore cannot be brought into China, upon pain of seizure. Reference was made by the Chinese authorities to the resolutions concerning the radio adopted by the Washington Arms Conference, one of which declares that all stations operated within the territory of China by foreign governments or the citizens or subjects thereof under treaties or concessions shall limit the messages sent and received by the terms of the treaties or concessions under which they are established. The American contention is that none of the arms conference treaties are yet in effect, not having been ratified by all the signatories.

Attention also was called to the resolution providing that stations maintained without the authority of the Chinese Government shall be transferred to the Chinese and operated under direction of the Communications department.

The refusal of the Chinese Government is regarded by American interests in China as a further example of the growing tendency of Chinese officials to quibble over every technicality when foreigners are involved, and to read extraneous privileges and precepts into international agreements.

Vesper Services at WGY Are Multiplied

EVERY Sunday afternoon a little group of people assemble in the radio studio of WGY, in the midst of the towering factory buildings of the General Electric Company at Schenectady, N. Y., and conduct a vesper service, including organ selections, hymns, Scripture reading and sermon. The group in the studio is small, but many thousands in city and country participate in the devotions.

These services not only enter many homes, but they are multiplied by means of receiving sets and loud-speakers, and made to furnish the religious inspiration of other gatherings in distant places. For example, the Railroad Y. M. C. A. at Oneonta, N. Y., no longer arranges for a special afternoon service, but instead receives WGY; and, according to a letter from the general secretary, A. C. Lange, "these services come through very clear, and are enjoyed by all who attend."

Charles J. Clark, a merchant at Holland Patent, N. Y., informed WGY that the Baptist Church at that place was closed recently on account of the scarcity of coal. He invited the congregation to meet with him in his home, and they listened to the service broadcast by WGY.

New Westinghouse Building in New York City

THE Westinghouse Electric & Manufacturing Co. has leased 12 floors in the new 23-story Westinghouse Building, to be erected at Broadway and Liberty street, New York City.

KING SR. VARIOMETER
150 to 600 Meters
No outside connecting hardware used—reducing capacity losses. Rugged—Solid. Size 4¾"x 4¾"x3".
Guaranteed by manufacturer direct to user.
Retail price $2.50
Ask your dealer
Aremco Mfg. Co., 30 East 23rd St., N. Y. C.

RADIO PANELS
High dielectric resistance.
6"x24" $1.00
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12"x24" 1.75
Manufacturers' special sizes solicited.
Agents wanted.
PAGESON COMPANY
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RADIO MAILING LISTS
12,400 Radio Dealers, covering U. S. by States, per M $7.50
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1,757 Radio Supply Jobbers, covering U. S. by States, per list $15.00
260 Radio Stations, per list $4.00
257 Mfrs. who make and assemble complete Radio Sets, per list $4.00
25,000 Radio Amateurs and Managers of Radio Stations, per M $7.50
Ask for price lists for Canada, England, other lists.
TRADE CIRCULAR ADDRESSING CO.
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Radio Supplies of All Kinds to Suit Your Needs

"The Little Wonder"
FOR BOYS AND GIRLS
CRYSTAL SETS
Unassembled-Net **$3.50**
Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at $5.00.
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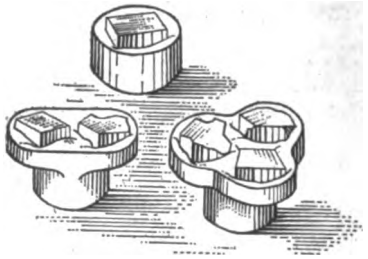

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Established 1876

YOU DX HAMS!
Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20?
This hook-up actually goes out and drags the distance in, and lays it at your table.
All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?
If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

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WILLARD

WILLARD RADIO CO.
Dept. R. W., 291 Broadway, New York

REINARTZ CIRCUIT
EVERY PART COMPLETE
1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD variable condenser, 1 13-plate .00025 MFD variable condenser, 3 inductance switches, 16 switch points and nuts, 3 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, necessary bus bar wire, 1 high grade Radion panel and diagram and complete instructions..... **$10.00**

FLEWELLING CIRCUIT
EVERY PART COMPLETE
2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak, 1 23-plate .0005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 6 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit **$11.00**

TWO STAGE AUDIO FREQUENCY AMPLIFIER
EVERY PART COMPLETE
1 7x9 panel, 2 audio frequency transformers (5 to 1 ratio), 2 rheostats, 2 V. T. sockets, 3 jacks (double circuit), 7 binding posts, 1 variable resistance leak, necessary bus bar wire. Can be used successfully with any circuit..... **$11.00**

TUNING and DETECTOR UNIT and TWO STAGES OF AUDIO-FREQUENCY AMPLIFICATION
List **$35.00** per unit
Built in solid Mahogany finished cabinet measuring 7x7x14 inches for Tuner and Detector unit and 7x7x8 inches for amplifying unit.
Affords an unusually high range of program selectivity and local stations can easily be tuned out to secure distant ones. Guaranteed to give excellent results, only the very best materials being used in its construction.
Special Price **$21.75** per unit
Combination only **$40.00**

Write for our Catalog No. 7
Illustrating and describing all our products.

Every article advertised above is guaranteed both by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID on all orders of $5.00 or over east of the Mississippi River. All others include postage.

Radio Killing Phonograph Sales

C. J. ROSENTHAL appeared before the the Second National Radio Conference, at Washington, D. C., last week, claiming that, unless they paid royalties to the writers of songs and music used in their programs, the owners of broadcasting stations would be prosecuted under the copyright law. He was talking in defense of the Society of Authors, Composers and Publishers of America, and said in part: "The situation is serious. Radio is affecting the sales of sheet music and phonograph records. The radio sets are placed on top of the phonograph, which are not used any more. In New York, St. Louis, and Newark, N. J., apartments are being built with attachments to permit the use of radio in every apartment, and I believe that this will eventually be done all over the country.

When queried as to whether the song writers and phonograph people do not derive benefit from the advertisement that they gain through the broadcasting of the songs and music he replied that the benefits were negligible.

New Scientific Term

TWO young chaps with the usual boyish interest in scientific achievements were discussing an enunciating device used in a certain London store.

"It yells out the day's bargains," one explained. "They call it a stentorphone.'"

"Aw, we have one of those at our house," replied the other boy, with a twinkle. "We call ours 'Ma'!"

150-3000 Meter Couplers with free diagram	$4.00
Honey Comb Coil, DL No. 35-75	1.35
45 Volt B Batteries	1.75
22½ Volt B Batteries	.75
Amco Audio Transformers	3.00
Special WD-11 Transformers	3.00
King Variometer	2.25
Small Type Variometer	1.75
Coupler	1.25
Tru-Tone Loud Speaker	4.75
23 Plate Condensers	1.25
3 Plate Vernier	.75

3 lengths of bus wire free with every $3.00 order or over.

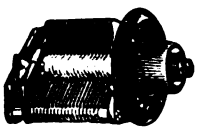
WHITE RADIO CO.
123 E. 23rd St. New York City
Cash with Order—Wholesale, Retail

DISTANCE

Can You Reach Over States?

If you're a real Radio Fan you want to jump over mountains and reach over states with the little old set. But be a sport and realize you've got to have the right instruments. Distance needs DX instruments—built for distance. We advise the following:

CONDENSERS



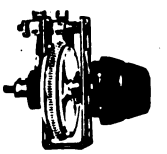
Vernier with Knob and Dial

			Reg. Price	Our Price
44 Plate	.001	MFD	$6.50	$4.56
24 Plate	.0005	MFD	6.00	4.00
14 Plate	.00025	MFD	5.50	3.06

Without Vernier

			Reg. Price	Our Price
43 Plate	.001	MFD	$4.50	$1.75
23 Plate	.0005	MFD	4.00	1.45
13 Plate	.00025	MFD	3.50	1.35

RHEOSTATS



Genuine Cutler Hammer Product. Necessary for fine adjustment. Reg. Price, $1.50. Our Price $1.25

Cutler Hammer Plain, regularly sold at $1.00. Our Price ..... 80c.

Fada Type, List, $1.00— Our Price ..... 60c.

Mail Order

Write out your choice and pin a Post Office Money Order to it. Mail at once to our Mail Order Department. Checks or stamps not accepted. Merchandise shipped postpaid East of the Mississippi.

D-X-Radio Co.

123 Liberty St. New York City

PATENTS
promptly procured. Trade Marks registered in the U. S. and abroad. Call or write. FREE ADVICE. Phone, Vanderbilt 7213.

FREE BOOK — MANUFACTURERS PATENT CO., INC. — 520 FIFTH AVE NEW YORK

Fifty-two issues for $6.00. Sub. Department, Radio World, 1493 Broadway, New York City.

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

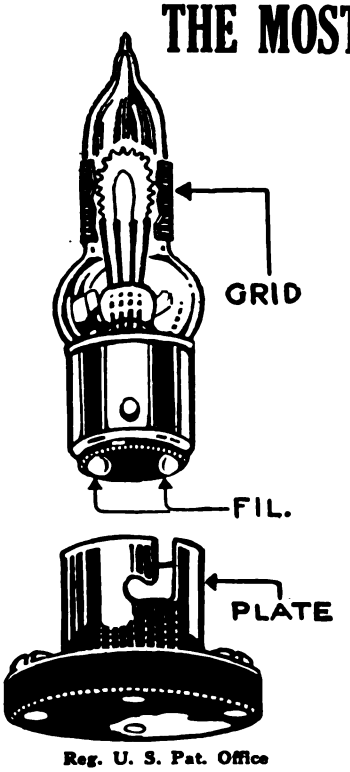
My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN, Patent Lawyer
32 Owen Building, Washington, D. C.
2276-P Woolworth Bldg., New York City

Subscribe direct or through your news dealer. $6.00 a year, $3.00 six months, $1.50 three months. Radio World, 1493 Broadway, N. Y. C.

THE MOST ECONOMICAL TUBE MADE



Reg. U. S. Pat. Office

DELTA MIDGET TUBES

Copyrighted

IS NOW AVAILABLE

3 Volt Dry Cell Tube, 22½ B Battery, Amperage .15

$2.50

Adapters for Standard Sockets

Dealers, Jobbers and Distributors write for quantity discounts

DELTA MIDGET TUBE CO.

241 MARKET STREET NEWARK, N. J.

If you can't get them from your dealer, write us direct

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CRYSTAL-TUBE FOR CRYSTAL SETS
Now ready for distribution. It gives clearer tune and protects your crystals. 25c (Silver). Our descriptive circular sent free on receipt of your address. (Discount to dealers.)
VACUUM ELECTRIC WORKS, Toledo, Ohio

FLEWELLING CONDENSER UNIT
Mica Dielectric—Copper Shielded
A compact, scientifically constructed, fully tested unit, providing three .006MF Condensers. This is the most efficient arrangement obtainable for the Flewelling Circuit.
$1.50 Per Unit—Postpaid. Dealers Write
ARNOLD A. HANSEN
328 CLAYTON DENVER, COLO.

Young Hopeful Learns the Code

Little Johnnie was just learning the radio code, and, after the habit of the animal, was practicing most of the time somewhat as follows: "Dit-dit-dit, dit-dah, dah-dit-dah-dah." This finally got on his mother's nerves, and she asked him to stop, saying: "Johnnie, if you don't stop dittling I am going to dah-day you, and then tell your father, who'll dah-dee you so that you will be all dahed out of dum-dum."

ASK ANY "ALL WAVE" COUPLER USER!

They all get
DX

STATIONS LOUD AND CLEAR.
with the

Genuine and Guaranteed Capitol
"ALL WAVE" COUPLER
Trademark

used in conjunction with any one of the

Six Simple, Super-Sensitive Circuits
Given Free With Each

"ALL WAVE" COUPLER

It is an established fact that anyone of the Capitol SIX SIMPLE SUPER-SENSITIVE CIRCUITS will bring in DX stations louder and clearer than any double circuit.

GUARANTEED WAVELENGTH
150-3000 Meters

PRICE $9.00, effecting a real saving, inasmuch as all **Variometers, Variocouplers, and loading coils are entirely eliminated.**

Patents Granted

CAPITOL PHONOLIER CORPORATION
60 LAFAYETTE STREET, NEW YORK

SUNBEAM

SUNBEAM MOTTO
FIRST FOR PRICE, QUALITY, AND SERVICE
11 years at the same spot

All standard merchandise guaranteed.
Prices going up. Take advantage of present low rate.
Our guarantee provides you satisfaction, or your money back, we will repay y transportation charges if not satisfied.

LOUD SPEAKERS

$45.00 Magnavox, new type	$39.50
55.00 Western Electric	50.00
20.00 Amplitone	15.00
20.00 Dictograph	15.00

TRANSFORMERS

U. V. 712	$5.85
U. V. 714	5.45
Acme	3.75
Dayton	4.75

CONDENSERS, BAKELITE

23 plate, Radio Stores	$3.75
43 plate, Radio Stores	4.10
23 plate, Vernier	4.00
43 plate, Vernier U. S. Tool	5.60
23 plate, Fibre ends	1.30
43 plate, Fibre ends	2.10

RECEIVING SETS

DeForest Radiohome Detector	$11.00
DeForest 2 Stage Amplifier	18.00
Acme 2 Stage Amplifier	45.00
Sunbeam Detector	45.00
Sunbeam 1 Step Amplifier	75.00
Sunbeam 2 Step Amplifier	125.00

(Complete with Tubes, "B" Battery, "A" Battery, Phones, Aerial, etc.)

BATTERIES

Storage, Eveready, 50 Amp	$14.00
Storage, Eveready, 90 Amp	16.50
Storage, Eveready, 110 Amp	18.00
"B" Bat., Eveready, 22½ V., Small	1.20

Sunbeam Multirange, Variocoupler, 150 to 3000 Meters, Complete with Solid Bakelite Variometer, Mounted $11.95

PHONES

Baldwin Superfone	$9.80
Baldwin unit	5.20
Brandes	5.90
Federals	5.40
Berwick	3.75
Murdock 3000 ohm Special	4.25
Auth	3.75

POTENTIOMETERS

Federal, 200 ohms	$1.25
Radio Corporation, 250 ohms	3.00

VARIOCOUPLERS

Dayton Fan	$7.50
180 Degree Silk Wound	2.35

VARIOMETERS

Dayton Fan	$6.50
Arrow	2.90
Searle Bakelite	7.50

RHEOSTATS

Cutler-Hammer Vernier	$1.2
Cutler-Hammer Non Vernier	.95
Safetyrite	.6

"B" Bat., Eveready, 22½ V., Large	$2.0
"B" Bat., Eveready, 45 V., Large	3.7

COIL MOUNTINGS

3 Coil DeForest	$5.9
3 Coil Crown	4.0

(DeForest Coils in stock)

MISCELLANEOUS

2" Dials	$ .2
3" Dials	.3
4" Dials	.50 .60 .7
Plugs Firth	1.0
Jacks Single circuit	.3
Jacks Double circuit	.6
Binding Posts, Nickel or Rubber	.0
Sockets	.30, .50, .75, 1.0
Ajax Socket-Rheostat	1.5
Micadons	.3
Grid Leaks, Freshman	.7
Paper Condensers, All Sizes	.1
Antennae Wire	.3
Insulators	.1
Crystals	.2

Coil, Only 3 Layer, Bank Wound, Silk Wire (Hook-up Furnished with Coil), $3.25

Select your set and write us for prices. We'll do the rest

SUNBEAM ELECTRIC COMPANY
71 THIRD AVE. (Bet. 11th and 12th Sts.), NEW YORK
Farm Lighting Plants at Bargain Prices.

National Radio and Electrical Exposition, San Francisco

THE National Radio and Electrical Exposition, which will be held in the Civic Auditorium, San Francisco, April 3 to 8, 1923, has been endorsed by the local electrical organizations by unanimous vote. They have agreed to co-operate in making the show a success.

The personnel of the San Francisco advisory committee, headed by J. C. Johnson, includes Louis F. Leurey, president of the San Francisco Electrical Development League; J. Mahoney, secretary and treasurer of the San Francisco Electrical Development League; H. C. Hopkins, president of the Pacific Radio Trade Association; R. E. Fisher, vice-president of the Pacific Gas and Electric Company; Earl Brown, president, California State Association of Electrical Contractors and Dealers; O. H. Miller, vice-president, Pacific Radio Trade Association; Victor Lemoge, president, San Francisco Association of Electrical Contractors and Dealers; Arthur Rowe, Garnett Young Company; Max Lowenthal, secretary and treasurer, Pacific Radio Trade Association; .R. D. Oyler, treasurer, California State Association of Contractors and Dealers; A. H. Halloran, editor and publisher, *Radio Magazine;* E. Martin, vice-president, San Francisco Association of Electrical Contractors and Dealers; J. W. Redpath, secretary, California State Association of Electrical Contractors and Dealers; Clyde Chamblin, president, California Electrical Construction Company, and A. Elkens, secretary, San Francisco Association of Electrical Contractors and Dealers.

Already reservations for approximately 75 per cent. of the total number of booths have been received by Mr. Johnson, who further advises that plans for the exposition will be completed in a few days, when work on the decoration of the Auditorium and the construction of booths will be started.

Dr. DeForest's "Phonofilm" Demonstrated

THE "phonofilm," a device which reproduces sounds synchronized with motion pictures, was demonstrated last week by its inventor, Dr. Lee De Forest. Dr. De Forest uses a standard motion picture camera and projection machine with his sound recording and reproducing attachment. In recording sounds a transmitter is used which transforms the sounds into electric waves. These waves are amplified and modulate an oscillator, connected with which is a gas-filled tube, called the photion. The intensity of the light in this tube varies according to the modulations of the oscillator, and its variations are recorded photographically on the margin of the film. In reproducing the sounds the process is reversed. Dr. De Forest will shortly demonstrate the phonofilm before the New York Electrical Society, and after that in a New York motion picture theater.

SUPER CRYSTAL
JAYNXON
GUARANTEED 50¢ LONG DISTANCE RECEPTION GUARANTEED 50¢
L.D.R.
THE VACUUM TUBES ONLY RIVAL
REFLEX AND R.F. CRYSTALS
Approved by radio experts. The very best crystal known to radio science.
Will make your set sound like Sousa's Band.
Free! Instructions "How to amplify your Crystal Outfit 10 to 20 times louder, all on an L.D.R. Crystal."
JAYNXON LABORATORY
57 DEY STREET NEW YORK, N. Y.

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STANDARD APPARATUS

AT ATTRACTIVE PRICES

Watch This Column EACH WEEK It Will Pay You

List Price	HEAD SETS	Our Price
$8.00	Brandes .....Superior.....	$5.50
8.00	Dictograph	5.75
8.00	Federal 2200 Ohms.....	4.95
7.50	Stromberg Carlson	4.75
6.00	Frost 3000 Ohms	4.25
6.00	Royalfone	3.75
5.50	Murdock Type 57	4.10
12.00	Western Electric 509W.....	9.50
12.00	Baldwin Type C, Master.....	8.50
6.00	Baldwin Type C, Single.....	4.00

LOUD SPEAKERS

$161.00	Western Electric	$145.00
55.00	Western Electric	50.00
45.00	Magnavox (New Type).....	31.50
40.00	Calliophone	30.00
20.00	Dictograph	15.00
15.00	Brittania	12.50

AUDIO TRANSFORMERS

$7.00	Federal	$5.60
7.00	Radio Corp. U. V. 712.....	5.60
6.50	Rasla	5.10
4.50	Thordarson	3.00
6.00	Amplex W. D. 12	3.95
5.00	General Radio	4.35
6.00	Jefferson	5.00
7.00	Amertram	5.95
5.00	Acme	4.10

PANELS

BAKELITE—3/16 inch Stock

7 x 10	$1.35	7 x 15	$1.95
7 x 12	1.45	7 x 18	2.50
7 x 14	1.85	7 x 24	2.95

HARD RUBBER—Grade A

7 x 10	$0.90	7 x 18	$1.45
7 x 15	1.35	7 x 24	1.90

SPECIALS

Firth 23 Plate Condenser	$1.30
Firth Triple Sockets	.90
Firth Double Sockets	.70
Millard Rheostats	.45
Double Phone Cords	.60
Fada Type Switch Levers	.23
Firth Crystal Detectors	1.00
Brach Lightning Arrestor	1.25
Bulldog Phone Plugs	1.00
Three Coil Mountings	3.50
Two Coil Mountings	2.75
Single Coil Mountings	.50
180° Variocoupler	2.79
Variometers	2.75
Vernier Rheostats	1.35
11 Plate Condenser	1.35
43 Plate Condenser	2.15
W D 11 Sockets	.30

Full Line of All STANDARD SETS and ACCESSORIES at Greatly Reduced Prices.

Write for Our Quotations.

All Mail Orders Shipped on same day as received. Send Money Order including Postage.

STUYVESANT Radio Corporation

15 E. 14TH STREET, NEW YORK CITY
Bet. 5th Ave. and Union Square

French Experts on Track of Wildcat Radio Station

FRENCH radio experts are convinced that it is a British or an American station which sends out only 400-meter wave lengths and sometimes jams the programs from the Eiffel Tower. These experts are convinced that it is not a German station, as at first suspected, since the voice of the sender is heard frequently breaking in with remarks in English. The sender violates radio rules by not giving a symbol, but military observers are adapting an apparatus to measure wave lengths and the direction from which they come, with the intention of complaining officially of the existence of the "zero" post.

RUSONITE

CRYSTAL RECTIFIER

MULTIPOINT

(Patent Pending)

A Synthetic CRYSTAL DETECTOR sensitive over its entire surface

Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.

Price, postpaid, mounted Sensitiveness guaranteed 50c

RUSONITE CATWHISKER

14-Karat Gold Multiple contact. Supersensitive 25c

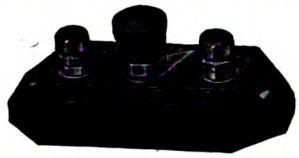
Order from your dealer or direct from us.

Rusonite Products Corp., 21 Park Row, N. Y.

FREE DIAGRAM AT YOUR DEALER

of the FLEWELLING SUPER CIRCUIT

FRESHMAN PRODUCTS— ESPECIALLY ADAPTED FOR THIS CIRCUIT



VARIABLE RESISTANCE LEAK

With .00025 mfd Micon Condenser Combined **$1.00**

Without Condenser **75c**

ANTENELLA

No antenna or aerial needed. Eliminates all the inconveniences in radio; operates from any light socket. Price only, **$2.00**

"MICON"

.006 Mica Condenser.....**$1.00**

.001 Mica Condenser..... **40c**

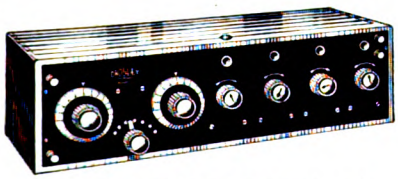
OTHER "MICON" SIZES

Size	Price	Size	Price
.00025	$ .35	.0025	$ .50
.0005	.35	.005	.75
.002	.40	.01	1.50

At your dealer's—otherwise send purchase price and you will be supplied without further charge. A diagram of the Flewelling Super Circuit sent free if your dealer can't supply you.

CHAS. FRESHMAN CO., INC.

106 SEVENTH AVENUE **NEW YORK CITY**



CROSLEY MODEL X

This Crosley Model X, costing only $55—is probably the most complete and satisfactory receiving set on the market today. Owners of the Crosley Model X have tuned in practically every broadcasting station in the United States, hearing the selections clearly and distinctly.

The feature of the Model X success is the one stage of Crosley Tuned Radio Frequency Amplification before the detector. By means of this, the incoming sounds, even from remote stations, are amplified many times before they reach the detector.

Other popular Crosley Models are No. VI, a two tube set at $28 and No. VIII, a three tube set at $48.

CROSLEY

BETTER—COST LESS RADIO

Write for Complete Catalog

Crosley Manufacturing Co.

3405 Alfred St. **Cincinnati, Ohio**

U. S. Patent Pending

"Old King Tut"

USED TO LISTEN TO REASON

That's why we made

Vac-Shields Non-Magnetic

Iron and steel have little use in Radio work, because they cause Hysteresis—High Frequency currents having a great affinity for these metals are quickly absorbed, resulting in decreased signal strength. Then again Magnetized metals when brought close to a Vacuum Tube cause an excessive flow of Electrons from the filament, which shorten the life of the Tube.

SIX REASONS WHY You Should Equip Your Set With "NON-MAGNETIC" VAC-SHIELDS

1—They are Non-Magnetic.
2—You do not need to Burn your Filament so Bright.
3—Prevent Interstage Electro Static Coupling.
4—Stop Howling and Distortion.
5—Enable you to Tune in Distant Stations.
6—Guard Tubes Against Breakage.

Order today by mail, Postpaid, $1.00.

ORANGE RESEARCH LABORATORIES

41 North 16th Street **East Orange, N. J.**

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE?

Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want.

ADDRESS SERVICE EDITOR, RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

Rexite Synthetic Crystals

Sensitive over the entire surface.

Dealers—Write for unusual proposition.

THE AIREX COMPANY

237 Centre Street New York

The most satisfactory book for beginners that has yet appeared.—Public Ledger.

RADIO SIMPLIFIED

By KENDALL & KOEHLER

Radio Instructors

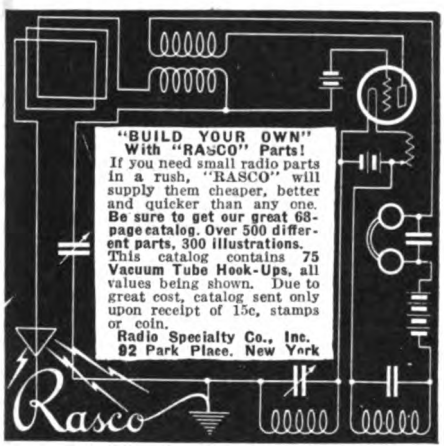
WHAT TO BUY
HOW TO BUILD
HOW TO OPERATE

A clear explanation of Radio in simple language with complete directions for assembling and installing home radio equipment. Will aid you in getting the best results from your set.

96 Illustrations including picture diagrams showing hook-ups, etc. Cloth, 250 pages, $1.00.

On sale at Booksellers or mailed on receipt of price

THE JOHN C. WINSTON CO., 36 Winston Bldg., Philadelphia, Pa.


"BUILD YOUR OWN"
With "RASCO" Parts!
If you need small radio parts in a rush, "RASCO" will supply them cheaper, better and quicker than any one. Be sure to get our great 68-page catalog. Over 500 different parts, 300 illustrations. This catalog contains 75 Vacuum Tube Hook-Ups, all values being shown. Due to great cost, catalog sent only upon receipt of 15c, stamps or coin.
Radio Specialty Co., Inc.
92 Park Place, New York
Rasco

The First 50 Years

"The first fifty years are the hardest."

In publishing, the first year is generally the hardest. Starting a new publication without a reader or an advertiser is a REAL undertaking—and what makes success? We believe it is giving the most valuable information in the most interesting form.

RADIO WORLD'S first subscribers mostly took it for three months at $1.50. At the end of 90 days came our first test—would they renew? To our agreeable astonishment 90 per cent. of them renewed but not for three months but sent their little six dollars for a year's subscription.

Our weekly increase in circulation is now averaging from fifteen hundred to two thousand, and if we can only hold out at this rate for fifty years RADIO WORLD will have the largest circulation of any weekly in the world. Even today at the end of our first year RADIO WORLD is the most profitable medium to our advertisers, and gives as good, often better, returns than the older monthly radio publications, which charge two or three times our advertising rates.

Readers, we thank you, and by the same token we ask you to suggest how we can make RADIO WORLD more interesting to you. Write and tell us your radio problems—what you want to know most, tell us of the articles you like, and especially tell us of the ones you don't like or disagree with—and so make RADIO WORLD for the coming year truly YOUR Radio Weekly.

It will continue to be our endeavor to give you ALL the news in radio from one to six weeks in advance of any of the radio monthlies.

Commercial Broadcasting in Germany

AFTER four months of experimenting the Express Service Company (Eildienst Gesellschaft), Berlin, has begun a daily service of financial and commercial news broadcasting to subscribers in various parts of Germany, according to a report to the Department of Commerce from Consul E. V. Richardson, Berlin. This company is financed by German capital, and is purely a private undertaking. Having arranged with the national government for the use of the radio station at Koenigswusterhausen on a limited basis for a definite period, a regular service of financial news is received from the United States, Switzerland, Sweden, and other countries, via the high-power station at Nauen, Germany.

This information is broadcast immediately by radio telephone to subscribers of the company. These number at present about 800, and are mostly banks and industrial institutions located in some 200 towns and cities. It is expected that New York quotations handled by this service will be available generally to subscribers within ten minutes of their dispatch from New York.

Each subscriber rents from the company the necessary receiving apparatus, paying for the service itself an annual fee of 300,000 marks, and for the apparatus an annual rental of approximately 200,000 marks. There are 2½-hour schedules daily, beginning at 9:30 a. m. and 5 p. m. The Express Service Company is represented in New York by a large American news agency.

Cuba and California Answer "Roll Call" in Chicago

CHIMES in Havana played "Home, Sweet Home," and a violinist in San Francisco gave a solo on a recent night for an audience in Chicago in a demonstration of overhead, underground and submarine telephone cables, and the wireless telephone.

Twenty cities from the Pacific Coast to Cuba answered when General John J. Carty, vice-president of the American Telephone and Telegraph Company, conducted a "roll call" during an address on world communications. As each station answered a light flashed upon a giant map, and the far-away operator, his voice magnified by amplifying devices, spoke to the Commercial Club. Among cities answering the roll call were Richmond, Va.; Philadelphia and Pittsburgh.

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Explanation to Advertisers

A considerable number of advertisements for this Anniversary Number of RADIO WORLD were received too late for publication.

The extra large edition required to meet advance orders necessitated going to press promptly. Therefore, it was incumbent upon the publishers to omit advertisements not received according to schedule.

These omissions are regretted, and it is hoped that advertisers in the future will adhere to publication time schedules, which are becoming more exacting as the circulation of RADIO WORLD is steadily increasing.

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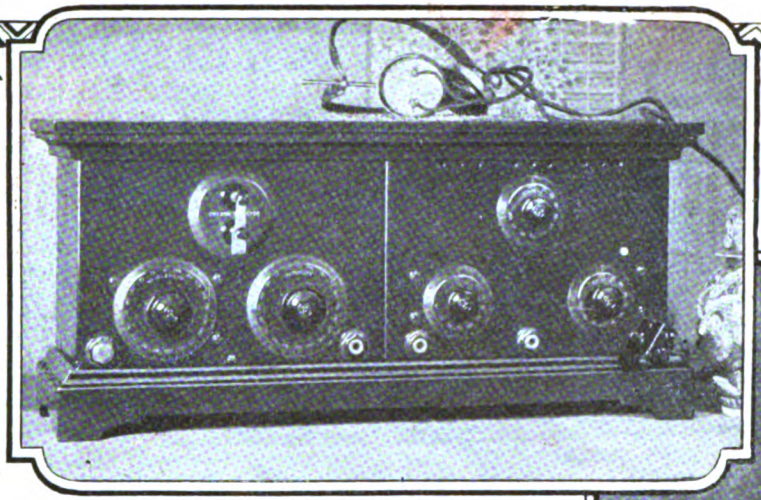

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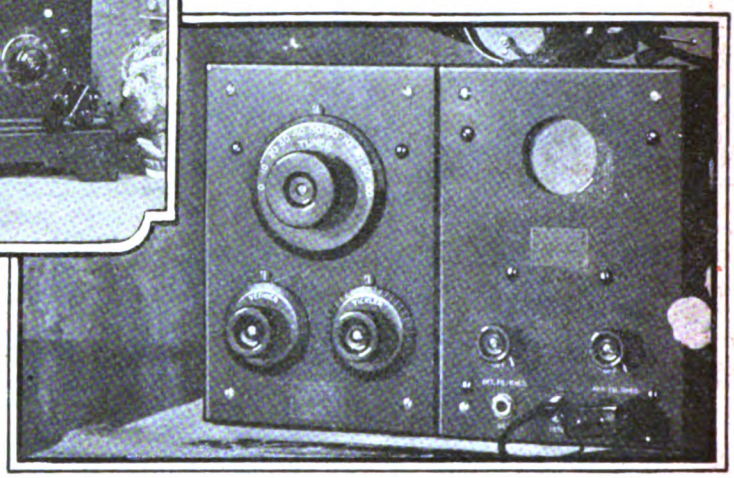

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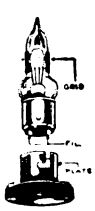

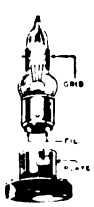

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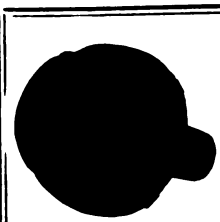

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 2. Whole No. 54 **April 7, 1923** **15c. per copy, $6.00 a year**

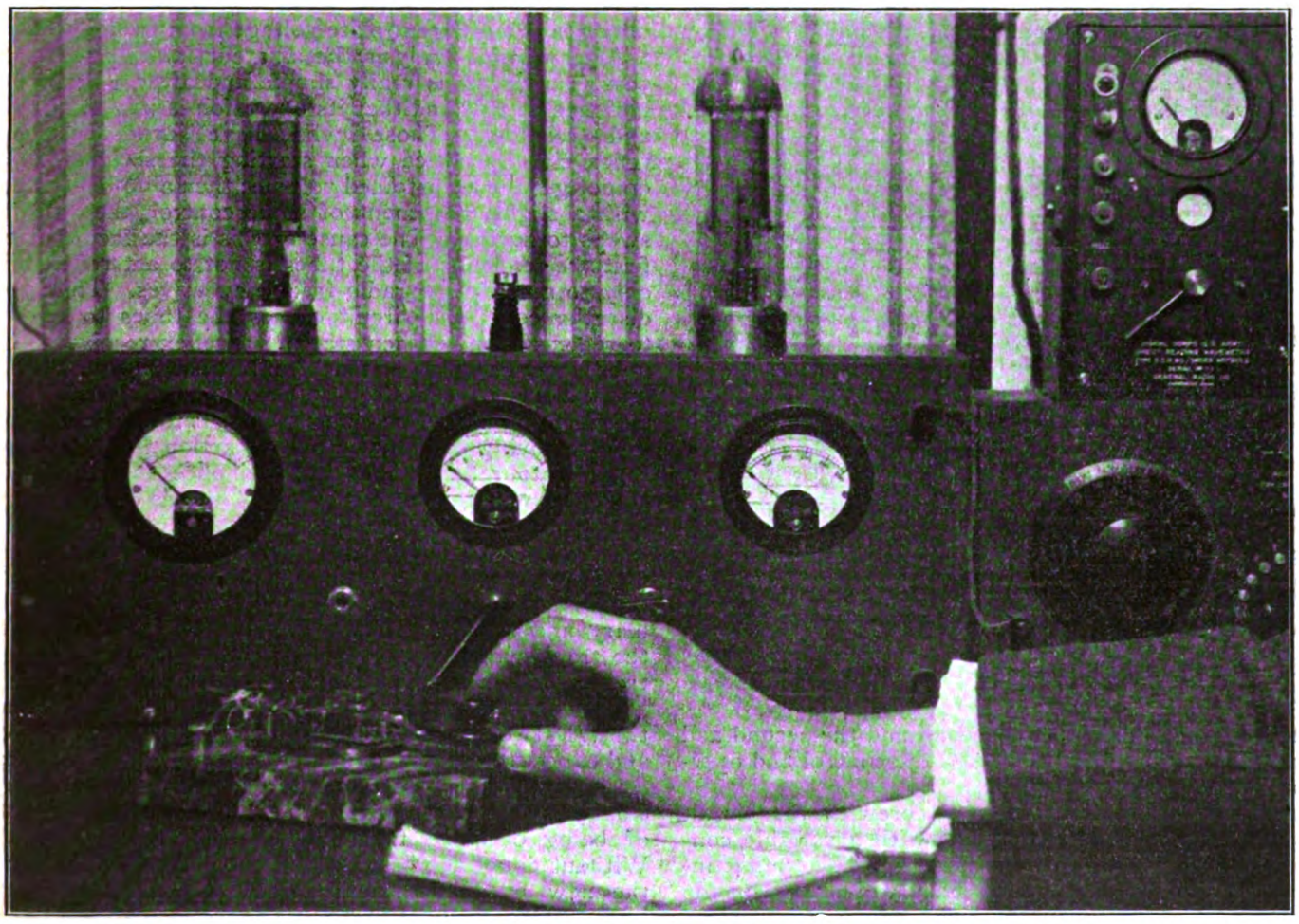
Amateur Builds 2,500 Mile Transmitter

By John Kent

MUCH attention in the past has been paid to receiving sets and very little to transmitters, although they are just as interesting and, to a great many experimenters, are far more intriguing.

The transmitter illustrated herewith was built by Paul Haus, a New York amateur whose call is 2VK. The set incorporates several novel features which would benefit prospective builders of transmitters. The set proper is rated at 150 watts and has a reliable working range of 1,500 miles, but reports have been received that show he has been heard 2,500 miles away.

As shown in the illustration, the antenna is connected directly over the center meter of the set and serves as the antenna for both the receiver and transmitter, change-over being made by means of the switch directly under the meter. This switch is a converted Amrad throw switch and it is possible to throw directly from transmitting to receiving with a flip of the hand. The receiver is shown connected to the right hand binding posts of the set. On either side of the switch are shown two jacks by means of which either chopper or key can be used for either ICW or straight CW.



(C. Photonews, N. Y.)

Extremely neat and compact 150 watt transmitter constructed by Mr. Paul Haus of New York City, which has covered 2,500 miles. It can transmit either interrupted CW or straight CW.

The three meters are the voltmeter, thermo-ammeter and milliameter, by means of which accurate check can be kept on the working of the set. It uses two 50 watt tubes which are located on top of the cabinet. The Heising system is used, changed to accommodate the builder's needs for CW instead of voice.

A point of note is the direct reading wavemeter located directly next to the transmitter and on top of the receiver. By means of the wavemeter, you don't need to "guess your wave is O. K." but your conscience will never bother you because all you have to do is switch it on and tell.

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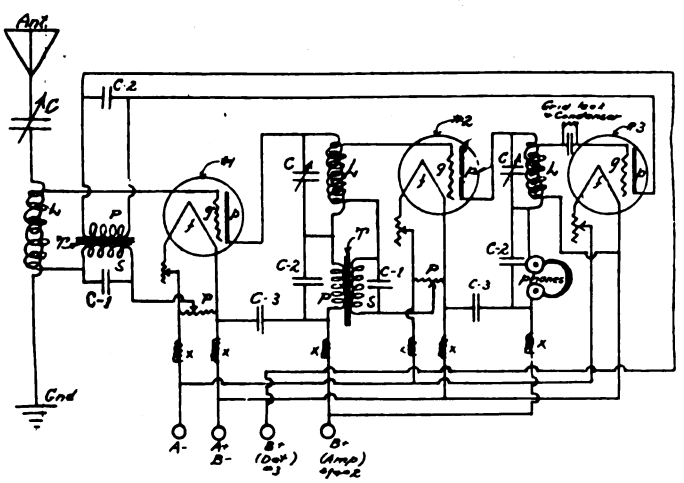
A Novel Three Tube Reflex Receiver

By C. White, Consulting Engineer

RADIO WORLD for Feb. 17, 1923, contains a single tube reflex circuit of my design. The circuit used one tube of combined radio- and audio-frequency amplification and a crystal detector. Many of my amateur friends after giving the circuit a good trial wrote me asking for the extension of the theory to more than one tube. At first there were many obstacles in accomplishing the desired design, but after a little experimenting I have been able to design the circuit that so many fans have been urgently requesting. Although from the diagram the average fan may think that the solution is rather long and complicated, still, the circuit is the most simple, reliable, and economical reflex for amateur use. If the circuit were simplified any more it would cease to be reliable although the price would be lowered. The number of controls have been reduced to a minimum and by the employment of the choke coils (x in the diagram) serious feed-back and oscillation trouble has been effectively avoided. The use of coupling between the tuned



. Circuit described by Mr. White in the accompanying text. This circuit, by the use of the double wound coil L, eliminates one of the controls heretofore supposed to be necessary.

plate circuit of the first and second and the second and third tubes has greatly facilitated the control and operation of the receiver.

As illustrated in the diagram herewith the circuit consists of a main tuning circuit with a variable condenser C and a tuning inductance L. The tuning inductance L is made up of two coils wound one on top of the other, on a 3½ or four-inch tube. The primary coil is wound on the tube with No. 22 D.C.C. magnet wire and has 50 turns. The secondary is wound on top with the same size wire having 40 turns. By the use of these coils the advantages of a coupled circuit are partially realized and the trouble of coupling adjustment and the cost of varicouplers are avoided. Then again, it has also been found from experiment that this receiver functions satisfactorily with the fixed coupling. All the coils marked L are constructed in an identical manner and all the condensers C are 23 plate variables. The condenser C-1 is a .00025 mfd. mica condenser and is used to by-pass the radio-frequency waves across the high impedance secondary of the audi-frequency transformer T. The letter P on the transformer labeled T stands for primary and S for secondary. A potentiometer is placed across the "A" battery in order to be able to afford an ample adjustment of negative potential for the grid circuits of the amplifying tubes No. 1 and No. 2. The potentiometers P should have a resistance of 250 or 300 ohms apiece. The choke coils X should have an inductance of .1 henry and the audio and radio by-pass condenser C-3 has a capacity of .25 mfd. The condensers C-2 are radio-frequency by-pass condensers with a capacity of .001 mfd. A grid leak and grid leak condenser is provided for the grid of the detector tube instead of a potentiometer as used on the grid of the amplifying tubes. Two separate "B" plus terminals are illustrated, one for the detector plate potential supply and the other for the amplifiers plate potential supply. This is feasible because the detector operates at a different plate voltage from the amplifiers.

After careful analysis the amateur fan will discover that this circuit is really simple and after a little experience he will find that its operation is just as simple and reliable. Those who have ever operated reflex circuits notice when starting the set that they do not get the accustomed volume; then all of a sudden, with a slight movement of some control, the volume swells to normal. The cause of this is the fact that at first the tendency of the tubes is not to act reflex but only to amplify the radio-frequency waves. Then the disturbance of the circuit causes the tubes to revert to reflex action. When starting a reflex receiver it is good practice to give it a "crank" just as you would crank your automobile. This cranking is performed by short-circuiting the phone terminals for a second and then removing the short. By this action the tubes are forced into reflex amplifying and once the circuit is started it will not fall out of "step" unless one or more of the tubes start in oscillation, which is next to impossible with a carefully constructed receiver using the illustrated circuit. In assemblying and trying out care should be exercised to test out the transformer primary and secondary connections. By connecting up the transformer as the manufacturer recommends the trouble of getting the coils in backward will be avoided.

Now for a word as to tubes. Do not attempt to use the WD-11 or like type of designed tube in this receiver and expect to get anything more than mediocre results. Such types of tubes have their elements spaced very closely and the radio-frequency amplification capable of being obtained from them is exceedingly small. Without doubt the best tubes to use in this circuit are the new UV201-A Radiotrons or C-301-A Cunninghams. Owing to the large size elements and high vacuum and other desirable characteristics these models are without peers for a reflex receiver. Then again, their low current consumption makes it possible to operate the three tubes with about 25 to 35% less current than one of the older models of the same type. Although these tubes are rated to take five volts at .25 ampere, I have found that they operate very satisfactorily with only four volts on the filament and a much lower current. The high vacuum makes the tube quite noiseless as a detector and highly desirable for this reason in a reflex circuit. Those who have already built this circuit or a similar one say that they would not trade it for any other, no matter what the cost. For distant work it can not be beat.

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Behind the Scenes During Radio Broadcasting

By A. G. Popcke

Studio Director, Station KDKA.

CURIOSITY is universal, and no doubt you have wondered what actually takes place in the studio during a radio program. It is very simple and not exciting, yet the performances are given under the closest supervision and governed by principles which have been discovered only by the most thorough research.

The studio is a room about 20 ft. by 30 ft. and 15 ft. high. The walls and ceiling are completely covered with heavy draperies and on the floor is a heavy rug, making the studio free from echo and reverberation, a necessary requirement for the transmission of a pure tone by the microphone.

The furniture is simple; a piano, cabinets containing amplifying apparatus, the necessary switches, chairs, music stands, and such musical instruments as are required. The microphone is supported on an adjustable and movable stand so that it can be moved readily to suit the nature of the performance.

A number of signal lights indicating when silence must be maintained are in plain sight so as to warn all in the radio studio to keep quiet when a performance is being announced and transmitted.

Adjoining the studio is an anteroom for the convenience of the artists, furnished with writing desk, registration book, comfortable chairs, and also a receiving set to pick up the performance being broadcast.

The artists are scheduled to arrive about fifteen minutes before the program is to start, in order that they may become accustomed to the surroundings and to enable the announcer to check the program so it will be sent out without delay during the time scheduled.

The performers are instructed regarding the proper position with reference to the microphone, as the relative positions of soloist, accompanist, and microphone are of fundamental importance in getting good results.

Sound varies inversely as the square of the distance from the point at which it is produced; that is, at double the distance the sound is one-quarter as intense. Voices vary as to resonance, quality and volume. The characteristics of the various musical instruments differ in intensity. These facts make it necessary to exercise great care in properly placing musicians to produce results in your receiver comparable to those heard from the concert stage.

By continually studying the distances at which various classes of performers produce the best results, by noting the nature of the various instruments and voices as to volume and resonance and by comparing the nature of the compositions and their accompaniment we have collected valuable data which enable us to place correctly various classes of performances for best results in transmission. Minor adjustments are frequently necessary after the first selection has been given, particularly to get the proper balance between the voice or instrument and its accompaniment.

Improper placing greatly reduces the effectiveness of good artists, and skill in placing appreciably improves the results with mediocre artists provided they are not off pitch. To the listener, the human element is entirely lacking and a performer's personality cannot compensate in any way for artistic shortcomings. The radio listener is impressed only by the music as he receives it.

The modulation meter is of great assistance to the studio director. This instrument indicates on a scale the intensity of sound transmitted. Sounds which give a reading of over 100 will not transmit without distortion, and, therefore, all music and speech must register below this point. If the meter reads too high, adjustments must be made either by increasing the distance between the performer and the microphone or by reducing the amount of amplification used. The speaking voice registers between 40 and 70; a soprano solo averages about 35 with peaks of 75 and 100 on higher pitches and louder notes. The accompaniment is about 15 to 25. During orchestral selections the meter usually reads between 20 and 80, averaging about 40.

Every program given is carefully checked on receiving sets by several persons, and a detailed report calling attention to any faults or imperfections is made.

The element of stage fright is usually present among new-comers although apparently they are singing only in a small room with practically no visible audience. Everybody realizes that members of the vast audience concentrate their entire attention upon their hearing and a slight slip will not pass undetected.

Interior view of the new KDKA studio at East Pittsburgh, Pa. Dr. Phillips Thomas is listening to a test of his new "glow" transmitter.

In the absence of applause there is nothing to give the performer any moral support, but if a hit is made, telephone calls and telegrams give this support in a very short time.

You have all noted a gradual improvement in the quality of transmission. This has been accomplished by continual research and experimental work by our large force of engineers, improving the various elements that constitute successful radio transmission.

To keep pace with the improvement in transmission strong efforts are being made by our radio broadcasting staff to make our programs of ever increasing interest to our vast audience. To hold the attention of so great a number, the programs must be: Entertaining and interesting, dignified and of high quality, educational to the average listener.

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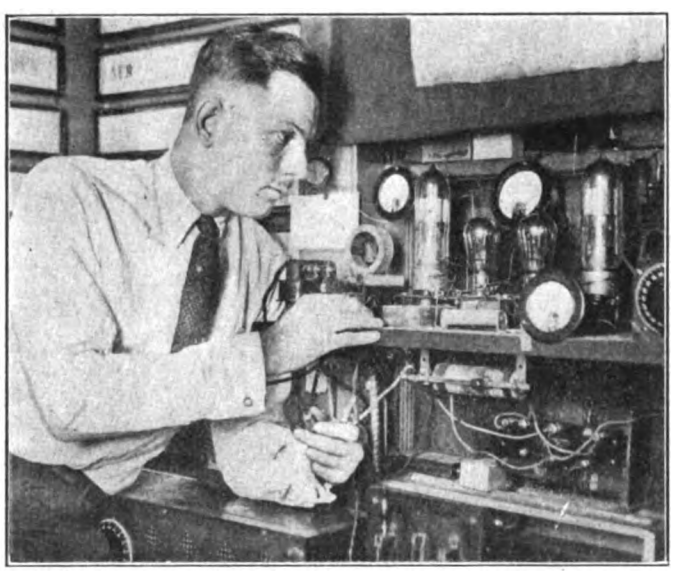
Proceedings of the Second National Radio Conference

Recommendations Mark New Era for Radio Public

THE second National Radio Conference announced on its adjournment, March 24, that its recommendations to the Secretary of Commerce mark a new era for the radio public. It recommended that the interference experienced by broadcasters and listeners be relieved by the opening up of a new wide band of waves by the government and a new assignment of individual wave lengths to broadcasting stations. This is made possible by the opening up of what was previously government reserved waves and the shifting of certain ship waves out of the broadcasting wave bands. The Department of Commerce, acting under its present authority, will be able to establish and enforce the new regulations, and thus bring order in the radio world. Summarized, the important recommendations of the conference were:



(C. Kadel and Herbert)
The Hoover cup, which is awarded annually to the owner of America's best amateur station under the ARRL was awarded this year to Station 2BM, owned by Frederick B. Ostman, 189 Broad Street, Ridgewood, N. J. The illustration shows Mr. Ostman and his transmitter which took the prize.

Previously all broadcasting was concentrated on three wave lengths—360, 400, and 485 meters. Now a new field extending from 222 meters to 545 meters can be created for the purpose. Within that field stations can be assigned individual wave lengths and divided into two classes. The higher power Class "A" stations corresponding to the present Class "B" stations can use the wave lengths between 288 meters and 545 meters, while lower powered stations (new class "B" stations) can use the waves from 222 to 286.

This will enable the higher power stations distributed in 50 localities and comprehensively covering the United States, to be within the reach of every listener. Suitable wave lengths are provided in the recommendations for the more than 500 existing lower power stations.

The report urges that the field of amateur activity be extended by allotting a band extending from 150 meters to 222 meters in place of the waves up to 200 meters now used. The band from 200 to 222 meters can be reserved for high grade continuous wave telegraph transmitting stations operating under special license. Technical and training school licenses can also occupy this band. The report confines spark amateur radio telegraph stations to the band 175 meters to 200 meters.

It also includes the provision that ships using 450 meter waves keep silent between 7 and 11 p. m. and, as soon as possible, readjust their equipment for transmission on wave lengths above 600 meters.

Provision is made in the recommendations for a new field of ship telephone service, enabling persons on shore to talk to those aboard ship. This can be carried out on waves far above broadcasting waves, so that no interference can result.

The reading of telegrams or letters by broadcasting stations should be permitted, says the report, so long as the signer is not addressed in person and so long as the text matter is of general interest.

Another recommendation is that simultaneous rebroadcasting be permitted as a service only on a broadcasting wave length, and with the authorization of the original broadcaster and of the Department of Commerce.

The new regulations recommended are based on a plan submitted by the radio inspectors of the Department of Commerce, and include elements from other plans submitted by the Radio Section of the Associated Manufacturers of Electrical Supplies, The National Radio Chamber of Commerce, the Institute of Radio Engineers, the American newspaper broadcasting stations and several other groups.

It was the unanimous opinion of the conference that the Secretary of Commerce in licensing stations has the authority under the present law to regulate hours and wave lengths of operation of stations, and to revoke or withhold licenses of stations when such action is necessary to prevent interference detrimental to the public good.

The committee also urged that the fullest co-operation be given by those who operate broadcasting stations and by the public with the Department of Commerce in the co-operative adjustment of local broadcasting problems in order to realize the fullest possibilities of the recommendations outlined.

The following is the membership of the Radio Committee: Maj. Gen. George O. Squier, War Department; Com. D. C. Bingham, U. S. N., Navy Department; W. A. Wheeler, Department of Agriculture; John W. Sutherin, Post Office Department; F. P. Guthrie, United States Shipping Board; Edwin H. Armstrong, Columbia University, New York; Dr. Alfred N. Goldsmith, Secretary, Institute of Radio Engineers; Prof. L. A. Hazeltine, Stevens Institute of Technology; John V. L. Hogan, Consulting Radio Engineer, New York; C. B. Cooper, C. B. Cooper Company, New York; Hiram Percy Maxim, President, American Radio Relay League; Prof. C. M. Jansky, University of Minnesota; A. H. Griswold, American Telegraph and Telephone Company; Leo Fitzpatrick, Radio Editor, Kansas City "Star"; D. B. Carson, Department of Commerce, Bureau of Navigation; W. D. Terrell, Department of Commerce, Bureau of Navigation; J. H. Dellinger, Department of Commerce, Bureau of Standards; L. E. Whittemore, Department of Commerce, Bureau of Standards; L. J. Heath, Treasury Department.

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The following are the wave allocations recommended by the conference:

Wave Frequency Kilocycles per sec'd. Above	Wave Length, Meters. Below	Service.
2300	130	Reserved.
2300	130	Government, CW, exclusive.
2300	130	Reserved.
2100	143	
2100	143	Government, CW, exclusive.
2100	143	Reserved.
2000	150	
2000	150	Amateur, CW, ICW, Ph, exclusive.
1700	176	
1700	176	Special Amateur, CW, ICW, Ph, Spk, exclus.
1500	200	
1500	200	Spec. amateur, and technical training schools, CW, exclusive.
1350	222	Aircraft, CW, ICW, Ph, non-exclusive.
1300	231	
1350	222	Class B broadcasting, Ph, exclusive.
1050	286	(See Note 1.)
1050	286	Reserved.
1040	288	
1040	288	Class A broadcasting, Ph, exclusive.
1000	300	(See Note 2.)
1000	300	Marine, CW, ICW, Spk, non-exclusive. (See Note 3.)
1000	300	Class A broadcasting, Ph, exclusive.
667	450	(See Note 2.)
667	450	Marine, CW, ICW, Spk, exclus. (See Note 4.)
667	450	Class A broadcasting, Ph, exclusive.
550	545	(See Note 2.)
550	545	Marine and aircraft, CW, ICW, Spk, exclus.
500	600	
500	600	Marine and aircraft, CW, ICW, exclusive. (See Note 3.)
500	600	Marine and aircraft, CW, ICW. Spk, exclus.
445	674	
445	674	Government, CW, non-exclusive.
445	674	Marine and aircraft, CW, ICW, Spk,, exclus.
375	800	
375	800	Radio compass, CW, ICW, Spk, exclusive.
375	800	Marine, Ph, exclusive.
315	952	
315	952	Reserved.
315	952	Government, CW, ICW, Spk, exclusive.
300	1000	
300	1000	Radio beacons, CW, ICW, Spk, exclusive.
300	1000	Reserved.
285	1053	
285	1053	Marine, Ph, exclusive.
275	1091	
275	1091	Government, CW, ICW, non-exclusive.
275	1091	Marine, Ph, exclusive.
250	1200	
250	1200	Government, CW, ICW, non-exclusive.
250	1200	Marine, Ph, exclusive,
235	1277	
235	1277	University, college and experimental, CW, ICW, exclusive.
230	1304	
230	1304	Government, CW, ICW, Spk, exclusive.
190	1579	
190	1579	Marine and point-to-point, non-government, CW, ICW, Spk, exclusive.
120	2500	Government, CW, ICW, Spk, exclusive.
95	3158	

Note 1—Not more than six CW amateur stations to be licensed to use wave frequencies above 1050 kc/s (wave lengths below 286 meters), for communication across natural barriers.

Note 2—A class A broadcasting station is a station of sufficient power to serve an extensive territory. Fifty territorial wave frequencies approximately 10 kc/s apart are to be assigned by Department of Commerce to local areas throughout the United States without duplication. The ten such areas within each of five national zones are to have wave frequencies separated by approximately 50 kc/s.

Note 3—The 1000 and 500 kc/s (300 and 600 meter) waves are for calling and distress purposes, with a minimum of traffic.

Note 4—Mobile service on the 667 kc/s (450 meter) wave is to be stopped between 7 and 11 p. m., local standard time, and to be transferred in so far and as soon as practicable, to wave frequencies between 500 and 375 kc/s (wave lengths between 600 and 800 meters.)

"Who's Who" at the Second Radio Conference

A list of those attending the Second Radio Conference, Department of Commerce, Washington, D. C., March 20-24, 1923, follows:

Edwin H. Armstrong, Columbia Univ., New York.
Major Louis B. Bender, Signal Corps.
Commander D. C. Bingham. Navy Department.
Dr. Louis Cohen, War Department.
C. B. Cooper, New York, N. Y., Natl. Radio Chamber of Com.
Dr. Frank W. Elliott, Davenport, Ia., WOC Nat'l Broadcasters' League.
Lloyd Espenschied, New York, N. Y., A. T. & T. Co.
Harry B. Gauss, Chicago Daily News.
Paul F. Godley, Cedar Grove, N. J., Adams, Morgan Co.
Alfred N. Goldsmith, New York, N. Y., Inst. Radio Engs.
A. H. Griswold, New York, N. Y., Amer. Tel. & Teleg. Co.
John V. Hanlon, Pittsburgh, Pa., The Pittsburgh Press.
L. A. Hazeltine, Stevens Institute of Technology.
John V. L. Hogan, New York, N. Y., Engineer.
Lt. W. S. Hogg, Jr., Navy Department.
C. Francis Jenkins, Washington, D. C. (Pictures via Radio).
John M. Joy, New York, N. Y., Motion Pictures Prod. & Distributors.
Lambdin Kay, Atlanta, Ga., Atlanta Journal.
Hiram Percy Maxim, Hartford, Conn., American Radio Relay League.
Elam Miller, New York, N. Y., A. T. & T. Co.

(C. Fotograms, N. Y.)

Joseph C. Smyth, 289 86th Street, Bay Ridge, Brooklyn, N. Y., who is the winner of the World's Championship for receiving code, taking 55 words a minute on straight code work.

P. E. D. Nagle, Department of Commerce.
E. E. Plummer, Chicago, Ill., Radio Digest Illustrated.
George Schubel, New York, N. Y., Radio Broadcasting Soc. of America.
H. R. Searing, New York, N. Y., Nat'l El. Assn.
Eugene Sibley, Air Mail, Post Office Department.
John W. Sutherin, Post Office Department.
K. B. Warner, Hartford, Conn., Amer. Relay League.
W. A. Wheeler, Department of Agriculture.
Captain R. B. Woolverton, Signal Corps.
C. A. Beasley, representing W. J. Baldwin, Birmingham, Ala.
Carl H. Butman, Washington, Radio News Service.
Dr. Louis Cohen, Signal Corps.
J. C. Gilbert, Department of Agriculture.
Louis Jay Heath, Treasury Dept.
Raymond E. Huntington, Wellesley Hills, Mass.
H. P. Perrill, Office Chief U. S. Coordinator.
Harold J. Power, Medford Hillside, Mass., Amer. Radio Res. Corpn.
Maj. Gen. Geo. O. Squier, Chief Signal Officer, U. S. A.
F. P. Guthrie, Shipping Board, Radio Section.
Prof. C. M. Jansky, Univ. of Minnesota.
Leo Fitzpatrick, Kansas City Star.
D. B. Carson, Dept. of Commerce.
W. D. Terrell, Chief Radio Inspector.
J. H. Dellinger, Bureau of Standards, Washington, D. C.
L. E. Whittemore, Bureau of Standards, Washington, D. C.

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Now is the Time to Build a Universal or All Wave Receiver

By Frederick J. Rumford, E.E., R.E.

IT is probably only a question of time before most of the radiophone broadcasting stations will be sending on a much higher wave length than at present. When this happens, radio fans who have the present day equipment, which is only capable of receiving from 150 meters to 500 or 600 meters as its maximum wave length, will find it necessary to load their sets with those cumbersome loading coils, which are anything but efficient. Therefore, the desirability of having a set of the kind described herewith will be apparent.

This set is efficiency in every respect, is flexible and makes it possible to receive on wave lengths from 150 to 20,000 meters. It is easily operated and uses the efficient Armstrong regenerative hook-up. The controls are few and when it is desired to receive on a higher wave length, it is only necessary to withdraw the present coils and insert the desired coils in their respective plugs.

The hook-up used is a great DX getter and DX fans who spend the later hours of the night trying to tune in long-distance stations will find this set practical.

The set the writer built was designed so that it would function properly with one WD-11 dry cell tube.

This set was designed with the idea that the prospective builder might at a later date wish to install additional amplification. Therefore, the two additional binding posts marked O. P. were placed so that with two jumper wires the set could be easily connected with the amplifier. The tuning accomplished is by varying the relation of the coils and the condensers V and VI.

Referring to the illustrations herewith, Fig. 2 shows a front view of the panel with its correct dimensions and proper symbols. Fig. 1 shows the hook-up of this set. Here is a list of the necessary parts and their estimated costs:

1	Formica panel, 9x12x¼	$3.24
1	Soft wood base, 12x9x⅜	.50
8	Binding posts at .10 each	.80
1	Single circuit jack	.75
1	Plug	1.00
1	43 plate variable condenser	4.00
1	23 plate variable condenser	3.50
2	Three-inch dials at .50 each	1.00
1	Calibrated triple coil mounting	5.00
1	Vernier rheostat, 2½ ohms resistance	1.50
1	Grid leak and condenser	1.00
1	35 turn honeycomb coil, mounted	1.50
1	50 turn honeycomb coil, mounted	2.00
1	75 turn honeycomb coil, mounted	2.50
1	WD-11 dry cell vacuum tube	6.50
1	Dry cell, 1.5 volts	.40
1	Pair 3000 ohm head phones	5.00
1	45 volt B battery	3.00
1	Complete set of antenna and ground parts	4.00
1	Phone condenser (fixed)	.25
1	Complete set of accessories, wire, screws, tubing	2.00
		$49.44

When using more than one tube an additional battery should be used for each additional tube used. The batteries should be wired in multiple.

In starting the construction of this set the builder should mark and drill all the holes that are necessary. When this has been done a good rubbing with No. 0 sandpaper and then a rubbing with a high grade linseed oil will produce an excellent finish. The base of soft wood should be given a couple of coats of a good insulating compound. After this has dried, mount the panel on one of the long sides of the base by means of several brass wood screws. Now mount the following parts upon the panel: triple coil mounting, condensers, dials, jack, rheostat and binding posts, and the little shelf at the back of the panel for the mounting of the WD-11 socket. This shelf is held in place by two brass wood or machine screws which are fastened from the front of the panel and hold the shelf rigid. The socket is then mounted upon the shelf. I advise using an adapter and the usual standard type socket as at a later date, if the builder should desire to use a radiotron tube, he easily can do so by slipping the adapter out of the socket and inserting the radiotron tube in the socket. The only other change necessary will be to use a six volt storage battery for the heating of the filament.

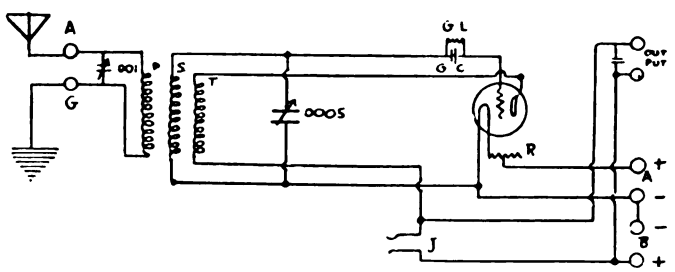

Fig. 1. Hook-up of Mr. Rumford's Universal All Wave Receiving Set.

The writer has tried another method of mounting this tube, that is the WD-11, and this method is to take the usual WD-11 socket and place up against the back of the panel and screw the brass wood screws in from the front of the panel into the socket proper which is a far better method then either of the above two.

If the builder wishes to save himself considerable work on the drilling of the panel, he can eliminate the ventilation holes on the panel proper, as the glow from the filament of the WD-11 tube when it is heated is barely visible.

The grid leak and grid condenser as well as the phone condenser can be mounted upon the base proper. The B battery can be mounted upon the base, which will help greatly to hold the set more firmly upon the operating table.

When he has the right idea from a study of the diagrams as to how the wiring ought to be done, the builder should connect a wire from the aerial binding post to one of the connections of the primary honeycomb coil, and another wire from the ground binding post to the remaining connections of the primary honeycomb coil. Now connect a wire from the aerial connections to the rotor of the 43 plate variable con-

(*Continued on next page*)

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Government Radio Messages Aggregate Millions

DURING the first quarter of the fiscal year 1923, the Naval Communications Service transmitted about 4,500,000 words, the Navy's part of which was 3,000,000, some of which necessarily was administrative, in connection with the Communications Service. It is surprising that the next largest user was the Department of Agriculture with nearly 500,000 words.

In the calendar year, the Navy handled a total of 15,768,308 words for the Government through its shore stations. Of this total, 10,884,217 were naval orders and despatches. The balance, nearly 5,000,000 words, was for other departments, both the Agricultural and War Department filing over 1,000,000 words each. All told, 16 different bureaus used the Naval radio service, including the White House and the House of Representatives.

Based on commercial rates, the Communications Service for the year ending June 30, 1922, handled for the Navy $2,721,000 worth of business and $1,040,667 for other Government departments. The Navy receives no transfer of funds or re-imbursements for the work performed for other Government departments, yet the savings are actual. The Navy has these necessary facilities and offers them to other department's use for official business. During the fiscal year 1922, the commercial work handled amounted to $277,122.42.

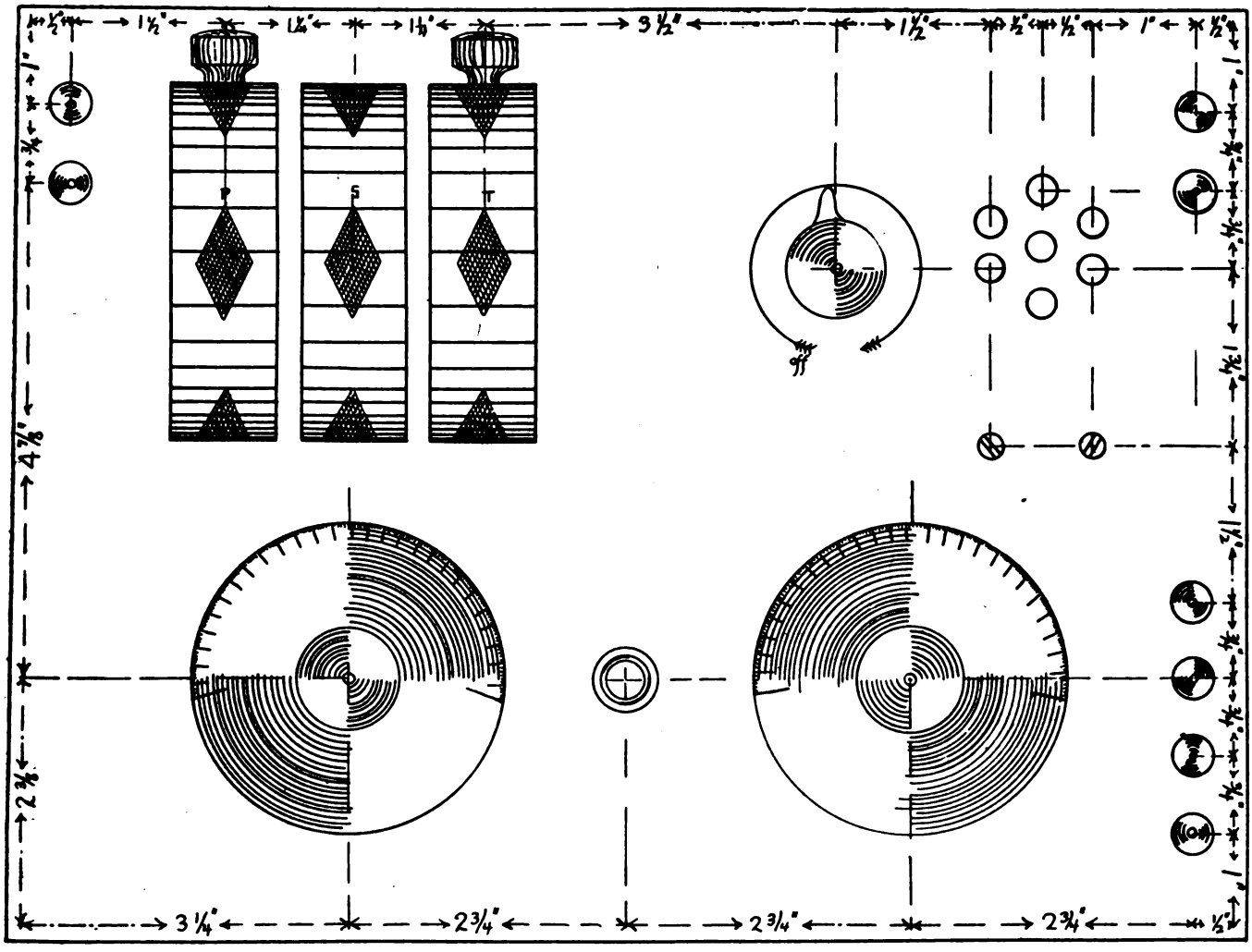

Fig. 2. Front view of panel, with correct dimensions and proper layout, used in building Mr. Rumford's Universal All Wave Receiver.

(*Continued from preceding page*)

denser, and still another wire from the ground connections to the remaining or stator connections of the 43 plate variable condenser. A wire is now run from one of the connections of the secondary honeycomb coil to one side of the grid leak and condenser, and from the remaining side to the grid post of the vacuum tube socket. The remaining side of the secondary honeycomb coil is connected with one side of the filament wire. The 23 plate variable condenser is shunted across the posts of the secondary honeycomb coil. Another wire connects with one side of the tickler honeycomb coil and connects with the plate post of the vacuum tube socket. The remaining side of the tickler honeycomb coil connects with the upper blade of the jack. The lower blade of the jack connects direct with the positive of the B battery. A wire also connects with the upper blade of the jack and with the upper output binding post. The remaining binding post connects with the positive of the B battery. Across these two binding posts is shunted a fixed phone condenser. A wire also connects with the negative side of the A battery and with one post of the rheostat. The remaining post connects with the filament post of the vacuum tube socket. The positive post of the A battery connects direct with the remaining filament post on the vacuum tube socket. There is a short jumper wire connecting the positive of the A battery to the negative of the B battery. This wiring should be done with No. 14 bare copper wire, insulated with varnished tubing.

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Super Regeneration Simplified

By O. S. Kelly

MOST of the failures of the Armstrong super-regenerator, charged to technical adjustment and technical construction are wrong. The circuit is primarily an amplifier—the best developed to date—and when the cardinal points of amplification are respected, the circuit "perks."

The outstanding facts in the operation of any circuit are the limits to which the "tubes" or "bottles" can be forced, and but very little has been said about putting the circuit to work—i. e. from a non-technical standpoint.

Balance or resonance of grid and plate circuits are absolutely necessary. Any variation in these circuits requires a corresponding change in "grid bias" and plate

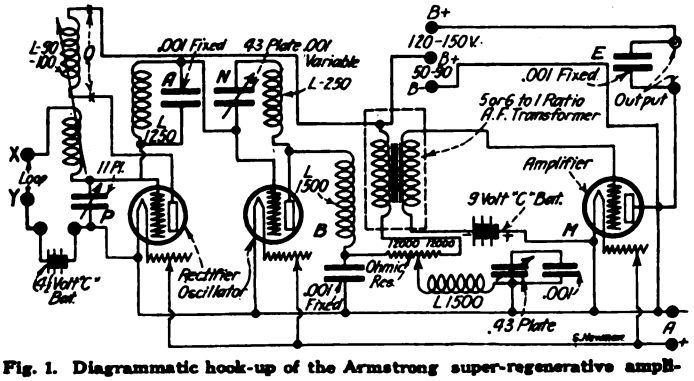

Fig. 1. Diagrammatic hook-up of the Armstrong super-regenerative amplifying circuit, as described by Mr. O. S. Kelly in the accompanying text.

battery. Example: Change the oscillator tube—you must meet the characteristic requirements of that particular grid, plate, impedance and capacity, which is readily accomplished by changing the *value* of condensers and *plate* and *grid voltage*.

The three tube circuit equipped with a filter (the 12,000 ohm two unit type) is by far the most powerful and most satisfactory. A single tube does very well, but after using some 37 circuits in different combinations, and tubes varying from the WD-11 to the U.V. 202 50 watt radiotrons, it is my opinion that for all practical purposes the U.V. 201, U.V. 201-A—the J. or 206, 216 A Western Electric or the Type C 301 A—or 301 Cunningham, is all the average amateur can use.

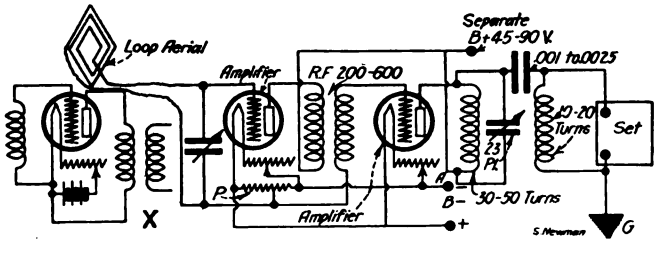

Fig. 2. Showing how to add a separate heterodyne if you wish to get more distance out of your super.

In building a super-regenerative set the first requirement is good condensers—mica is the only thing to use, and be very sure that they do not approximate the rated value.

Referring to the accompanying illustration, condensers A, B, F, E must be mica for results; and must not vary over limits +.0001 or —.0001. While it is true that the variable 43 plate at F will compensate the .001 fixed-condenser it will not control A, B and E only in a secondary measure. After completing and soldering all connections test all sockets for good contact—and absence of high voltage in filament circuit.

The following rules will tune any "sooper" of this class:

1. Turn all condensers to minimum—zero.
2. Hook up loop to input—outside turns at (X), inside to (Y).
3. Turn coupling to minimum—zero. Turn on the bulbs—light filaments bright. Hook B+ to about 80 volts—a squeal—when you vary (N).
4. Turn "Tickler"—a loud roar will greet you. If it does not and a squeal is absent, reverse connections on tickler at (X). Right here is where the average boy will quit. The roar, popping, frying and all the noise in the world is there. Anything you move makes it worse. But let her roar, and go on to number
5. Turn tickler to approximately close coupling (80° on a 90°)—(160°-170° on a 180°) and push honeycombs (if they are used) up close, ¼-⅜-inch.
6. Drop potential on the B+ taps one at a time until the roar quiets and a loud open resonant sound appears and the high frequency whistle or squeal is but faintly heard. Reverse procedure if it does not roar.
7. Now you're getting somewhere—turn tickler to minimum slowly and vary (P) until you mush signals. Slowly adjust (N), (F), (P), (Q) in order here given and you will be getting results.
8. Try out different tubes in rectifier, oscillator and amplifier sockets. Some will do much better than

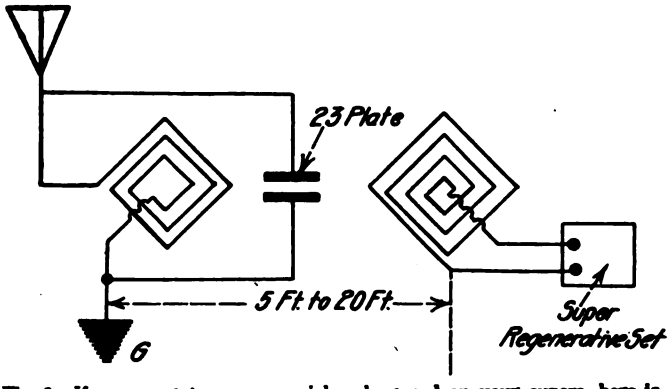

Fig. 3. If you want to use an aerial and ground on your supers, here is an idea that will help you—use two loosely coupled loops.

others and a few won't work at all only on very low plate voltage (10-15 volts).

9. Practice tuning using 8-9-10-11-12 turns on a loop 3 ft. square, or 10 turns on a loop 18 inches square. Turns on a 3 ft. loop should be spaced ⅜-½-inch. On 18 inch loop 3/16-¼-inch apart. Don't use a large loop or antenna. You are wasting time. If you just can't get that old cage or sagging flat top out of your mind use two loops, one on the antenna, one on the set. Tune the loop on the antenna. Then the one on the set. (See illustration.) Remember, the "Super" is a one job machine and it will amplify everything you let it have. It is entirely up to you.
10. Work out the peculiarities of your tubes. You will be surprised if you use "build up" or variable condensers at (A), (F) and (E). Try different plate potentials—when you get a good result mark it—then you can always return to it without guessing.

The idea has become prevalent that a super-regenerator is hard to adjust, and is no good for distance.

(*Continued on next page*)

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Cable Superseded by Radio in Navy

By Carl H. Butman

DESPATCHES for American naval vessels in the Near East are now being transmitted by radio from Annapolis and are being copied directly by vessels in the vicinity of Constantinople, with excellent results, according to Admiral Ziegemeier, director of Naval Communications.

Radio is becoming a very formidable competitor with cable service, and as far as the Navy is concerned, cables are almost obsolete. Messages are never routed by cable except to some South American countries, and if a man-of-war is there, they go by radio. Direct regular radio circuits are maintained between Washington and San Francisco and San Diego, and it is seldom that a single word is missed. Washington communicates directly with Puget Sound, and Puget Sound and San Francisco communicate every odd hour of the day.

On the Atlantic Coast, the Navy has seven main radio stations: Bar Harbor, Me.; Sayville, L. I.; Annapolis, Md.; Arlington, Va.; Cayey, P. R.; Guantanamo, Cuba and Panama, besides a large number of coastal radio stations. The station at Bar Harbor, Me., receives all official government messages from Europe, the Pacific and the fleet in the West Indies transmitting them to Washington over a leased wire. Since the fire at the Bar Harbor station, which destroyed some buildings and barracks there, the Navy has decided to turn this station into a coastal station and receive all trans-Atlantic and trans-continental traffic at Washington. Facilities in Washington for reception are being improved and it is contemplated that by the end of April, Bar Harbor will cease as the Navy's chief receiving station. This will save reconstruction of buildings there, eliminate the expense of the land line to Washington amounting to $25,000 a year, and cut the Bar Harbor personnel from 56 to 15 men.

Sayville is used as a transmittting station to the fleet and as a "standby" for Annapolis, which is the principal Atlantic Coast transmitting station to Europe and to the Pacific. Both Annapolis and Sayville are controlled from the Navy Building at Washington. Until recently the Government's method of communication with Admiral Bristol at Constantinople was from Annapolis to Paris via radio, over a leased land wire to Coblenz, Germany, thence to Vienna. From there, the message went by radio to a Naval vessel in the Mediterranean, which relayed it by radio to the Embassy at Constantinople.

Return messages were sent the same way except that the message originated on the station ship and, on this side, was received at Bar Harbor and telegraphed to the Navy Department. But during the last two months, messages have been copied direct from Annapolis by the Navy's station ship at Constantinople. Whether this can be done during the summer season remains to be seen.

NINE BROADCASTERS LICENSED

THE Department of Commerce licensed nine new broadcasters during the week ending March 24, one of which is a Class B Station located in Philadelphia. They are as follows:

Call	Station	Power
WDAH	Trinity Methodist Church, El Paso, Tex.	200 watts
KNX	Electric Lighting Supply Co., Los Angeles, Cal.	250 watts
KFFP	First Baptist Church, Moberly, Mo.	100 watts
KFEZ	American Society of Mech. Engrs., St. Louis, Mo.	500 watts
WRAL	Northern States Power Co., St. Croix Falls, Wis.	100 watts
KFHR	Star Electric & Radio Co., Seattle, Wash.	100 watts
WDAR	Lit Brothers, Philadelphia, Pa. (Class B, 400 meters)	500 watts
KFHH	McCue, Ambrose, Neah Bay, Wash.	50 watts
KFEY	Bunker Hill & Sullivan Mining & Const. Co., Kellogg, Idaho	10 watts

(*Continued from preceding page*)

This is not strictly true, for the circuits I have tested have given exceptional distance, even daylight range, for loop work. If you wish to increase your distance use two or three stages of radio frequency on the front end of a "Sooper," then reduce all B voltages as low as possible, for if you do not—it will paralyze. Too much noise for a "bottle" to handle—that's all.

Don't forget you must use tuned impedance or inductive hook-up on the last R. F. tube. (See diagram.)

When in doubt check your turns on loop and coils and go over your connections. When you have done your part the circuit will come in to more favor. These new types (U.V. 201A), (Cunningham 301A) amplifying tubes are very good (use 55-60 volts B+). You need not worry over critical filament adjustment, there is none. Just touch the filament rheostat—and hop to it. It takes time to balance up a line of tubes—three of them—but when they start working for you, you are amply repaid.

Don't fail to remember that noisy, roaring, ripping, mushy signals that increase as the tickler coupling is loosened (turned towards minimum) mean too much voltage in the B+ on the oscillator and rectifier tubes. More "C" battery (negative bias) weakens signals and causes distortion of either signals, speech, or music.

Every tube has certain internal characteristics and I have attempted to give you an average set of values that will work on most any old amplifier tube. You can refine and improve without limit.

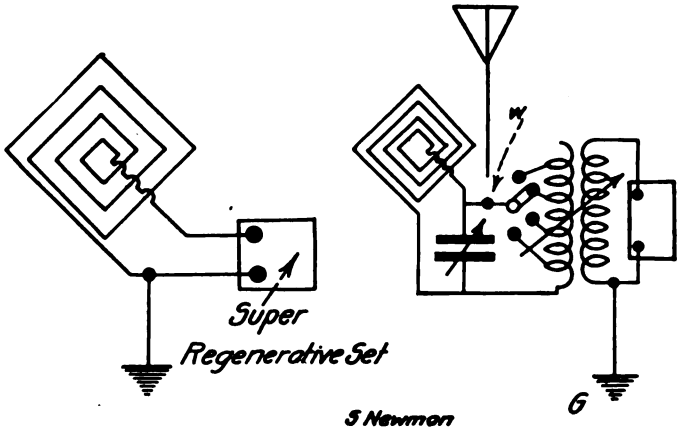

Fig. 4. If your tuning is too sharp and you want to broaden it, attach your ground as shown. If you want to add an aerial to your loop, try the method of hooking it on to W, and using a variocoupler as shown on the right.

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Sidelights From the Capital Radio Conference

By Washington R. Service

WASHINGTON, D. C.—Members of the radio conference were entertained informally at dinner on Friday by Commissioner of Navigation D. B. Carson and other officials of the Radio Section. The big dining room of the Ebbitt was the scene of the first radio "get-together" in this country at which representatives of every phase of the art and industry were present. Work of re-distributing wave lengths was dropped for the moment, the business of the meeting being purely social.

* * *

Secretary Hoover believes that the universal need for more broadcasting waves will be fulfilled by the conference report. As soon as the distribution is decided upon, he will ask the president to issue an executive order assigning some of the Government waves for public use.

* * *

The plan of wave distribution presented by the radio inspectors to the radio conference was believed suitable for immediate application, whereas the compromise plan of the full committee cannot be put into operation for two or three months, it is understood, during which the already congested atmosphere may be precipitated any moment.

* * *

According to Hiram Maxim, radio makes for peace and by developing international friendships through continued and instantaneous communication between different nations, may avoid misunderstandings and eliminate the need for wars.

* * *

Composers and authors desire royalty for the use of their compositions when broadcast, Mr. Rosenthal told the conference, asking the Department of Commerce to prohibit the stations licensed from using copyrighted matter without payment of fees. But the Department replied that it might as well require licensed stations to pay rent and for the use of patented radio apparatus. Authors must go to court, it was decided.

* * *

C. Francis Jenkins, the Washington inventor of radio transmission of pictures, asked for a special transmitting wave, and predicted the practical distribution of still and moving pictures within a short time.

* * *

Every time the transferring of the 300, 450 and 600 meter waves was mentioned, either Commander Bingham, of Naval Communications, or Mr. Guthrie, Radio Director of the Shipping Board, jumped up and protested. They strove, not unsuccessfully, to preserve these waves for ship communication. The suggestion that all spark sets be removed from ships was met with the statement from naval officials that an international question was involved and several years would be necessary for such a re-adjustment. One naval officer estimated that it would cost a million and a half dollars to replace sparks on naval vessels alone.

* * *

The preservation of efficient wave lengths for use in the mobile services, such as ships and aircraft, was voiced at the conference by naval spokesmen. Fearing that the public was not included at the conference, one representative suggested the selection of a member of the radio receiving body, but Secretary Hoover said he was a fan and would protect the public interests.

* * *

The S. S. "Leviathan" will have a 750 watt, duplex telephone set when she goes into commission, the radio conferees were told by representatives of the manufacturers.

* * *

The Detroit "News" spends approximately $100,000 annually in its radio activities, Mr. Campbell of that publication stated, explaining that "good will' was the only return.

* * *

Leo Fitzpatrick, of the Kansas City "Star," official representative of the newspaper broadcasters, explained that his sheet gained only 173 subscribers due directly to radio broadcasting. But they have more than 35,000 fans who complain of the least change or delay in their schedules.

Singing into the new Thomas "glow" transmitter at Station KDKA. This transmitter has no diaphragm and is said to give perfect sound reproduction.

(C. Keystone View)
Judge John Rounds, of the Conciliation Court at St. Paul, Minn., trying a case by radio. Judge Rounds is believed to be a pioneer in legal radio.

(C. Underwood and Underwood)
Sir Basil Thomson, former director of the detective division at famous Scotland Yard, broadcasts a farewell to the United States from WJZ's Waldorf-Astoria studio, New York City.

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"Chief Justice" Hoover of Radio

By Carl H. Butman

FOLLOWING in the lead of the great outdoor sport and the old favorite evening pastime, radio may take on an arbitrator. Just as Landis has come to have the "last word" in base-ball, and Hayes to write the "finale" of the movies, so Secretary Hoover may soon transmit "VA," the "30" of radio, putting an end to all arguments in the ether.

In calling the recent radio conference, Mr. Hoover offered not only to arbitrate radio disputes, but to make the necessary regulations which the Senate failed to provide. He has volunteered as a sort of foster father to this new art and industry, and hopes to clear up a threatening atmosphere. The conference in Washington, D. C., indicated whole-hearted, voluntary support by the several sections of the industry of an administration by him. It only remains for the radio public to co-operate to offset a threatened slump and remove the present broadcasting interference. Incidentally, Secretary Hoover's administration in his present capacity would save the industry the cost of a privately paid arbitrator.

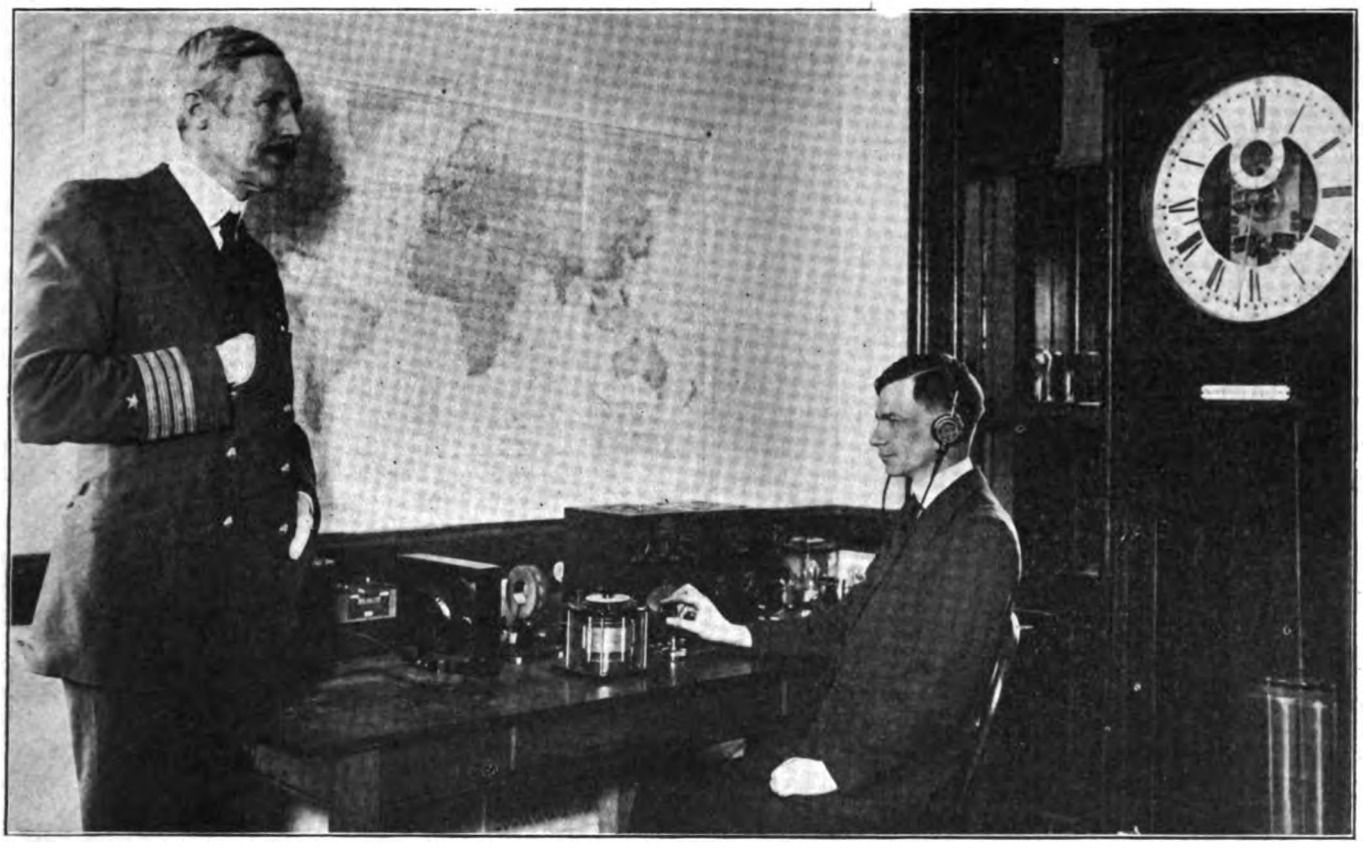
In the opinion of Major General George O. Squier, Chief Signal Officer of the Army, than whom radio has no more earnest supporter nor more generous technical contributor, the industry and public should co-operate with Hoover in his every wish.

"The failure of the Senate to pass the White Bill may be a blessing, although we all were disappointed at the time," General Squier said to the writer during the conference. The very lack of law requires a closer co-operation of the various radio activities in order to straighten out difficulties and combat interference, he explained. Co-operation is assured through the fact that manufacturers, engineers, broadcasters, commercial interests and amateurs have voluntarily subscribed to a wave length distribution and agreed to abide by such regulations as Secretary Hoover lays down as necessary. This indicates, he pointed out, how close the great radio family can be brought together when necessary.

The inventor of "wired-wireless" emphasized the great benefit to radio of a period of unhampered development and operation under voluntarily accepted regulations, instead of hard and fast laws, which could only be remedied by the passage of other laws dependent upon the action of a rather dilatory Congress. Changes in regulations found necessary during a year of such operation could be applied immediately, without reference to Congress. "The art is advancing so rapidly that we hardly know what to expect next,' General Squier said. "To-day radio is a service for the ear, but if the transmission of radio pictures— still and moving—is perfected, the eye may also be served.

"We must be ready to accept new views and apparatus at a moment's notice; not to do so would place this country in the rear instead of the van of radio progress." Since the White Bill was drafted, General Squier observed, many new phases had arisen which indicated that the bill was not entirely suitable.

"Secretary Hoover," the General said, "has practically volunteered to administer and arbitrate radio troubles for at least two years—free."



(C. Underwood and Underwood)

The Naval Observatory time signal office from which standard time is flashed daily to the country by telegraph and radio. Captain William D. McDougall, U. S. N., Superintendent of the U. S. Naval Observatory, is looking at the "original time."

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The Radio Primer

For Thousands of Beginners Who Are Coming Into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Clearly Explained

By Lynn Brooks

IN diagrams, the potentiometer is shown hooked up in such a position that it is practically short circuiting the A battery. Is this not a constant drain on the battery?

The fact that the resistance of the potentiometers commonly used, is very high, and is overbalanced by the almost lack of resistance in the rest of the circuit, prevents all but a very small and negligible amount of current flowing through it, even when the rest of the circuit is turned off. In some hook-ups this is taken care of by an independent switch breaking the circuit before the current gets to the potentiometer.

* * *

Why is it that when more than two steps of audio-frequency are used that the microphonic and outside noises overbalance the signals, and ofttimes make reception impossible?

With audio-frequency amplification every noise heard in other circuits, will be amplified along with the transmitted sounds. Thus it is that a scratch which is hardly noticeable in the detector, will be amplification along with the signals and because of its low note be so troublesome when amplified that it will exclude the signals at the output of the third stage. The same applies to the inter-tube noises. It is thus seen that no more than two stages can be utilized without allowance being made for extraneous noises which cannot be filtered, and are sometimes very bothersome if more than two stages are used.

* * *

Why is it that some stations will be received fine and then a sudden change will take place and they will be all squeals and howls?

This can be caused in two ways. The first is by the interference of some nearby receiver oscillating and causing interference by re-radiating on the same wave, or it can also be caused by the carrier wave of another transmitting station suddenly interfering with that of the first, causing a beat note which will interfere.

Can the interference of the nearby receiver be eliminated in any way?

No, this cannot be eliminated as long as the oscillations from the nearby receiver, or receivers, are of sufficient power to be noticed. The person owning a sensitive receiver can often detune a fellow listener's set simply by swinging his dials and getting his receivers to squeal. This is a drawback that cannot be eliminated, and consequently has to be put up with. It is possible to heterodyne a nearby set through this re-radiation of oscillations from a receiver.

* * *

In case the builder of a single circuit receiver desires to increase the wave length range of his receiver how may he accomplish it?

The simplest manner of doing this is to incorporate a suitable mounting and a concentrated inductance in the form of a honeycomb coil of the desired range. This should be inserted in the circuit between the antenna and the apparatus.

* * *

Will this method decrease the signal strength on the lower waves?

As the honeycomb is not used when lower waves are to be received some method of shunting the coil should be utilized. This can be accomplished by inserting a single point switch in the circuit, which will short the coil when it is not in use.

* * *

What is meant by "distributed capacity"?

Distributed capacity is the capacity between adjacent turns of an inductance. Between one turn and the next, the two turns act as the plates of a condenser, with the insulation acting as the spacing or insulation of the condenser. The effect of this is to seriously broaden the wave length of the inductance, and makes close tuning hard.

* * *

Name some of the methods of keeping the distributed capacity of an inductance at a minimum.

Some of the methods of keeping the distributed capacity of an inductance at a minimum are: Do not shellac the winding; use back winding if possible, or use staggered windings, such as spider web or honeycomb. There is no way of diminishing the distributed capacity of a straight flat-wound inductance, but if a flat-wound inductance is used, and shellac is also used to hold the turns, the distributed capacity will overbalance and the wave length will be so broad that correct tuning will be almost impossible.

Radiograms

The members of the House of Commons will not be subjected to the temptation of "listening in" to jazz music or other entertainment features on the wireless telephone, to the detriment of their attention to official business, it was announced by the Postmaster General in reply to a suggestion made by a member that receiving apparatus be installed in the House. To this suggestion Sir W. Joynson-Hicks, the Postmaster General, replied that he did not think it was his duty to provide "such a counter attraction" in the Chamber of the House.

* * *

Professor Albert Einstein, of Berlin, Germany, and "relativity" fame, has erupted again with a new theory which, however, will not achieve much publicity as he says it is unintelligible to laymen. In reply to a question by a daily newspaper correspondent, Prof. Einstein is quoted as saying: "I can tell you in one sentence what it is about. It concerns the connection or relation between electricity and gravitation. It is grounded on the theoretical speculations and discoveries of the English astronomer, Eddington. It is a purely mathematical theory and, therefore, cannot be explained to a layman."

The first intercollegiate debate held by radio between New York University and Trinity College of North Carolina was broadcast one evening last week from WOR, the radio station of Bamberger & Co., Newark, N. J. Radio fans will decide who won by sending their votes to WOR. Several votes were received by telephone a few minutes after the last speaker had concluded his rebuttal.

* * *

For the second time within a week wireless telegraphy came into play when W. P. Johnson, fireman on the Fenwicks Island Shoal lightship, thirty miles southeast of Cape May, N. J., was attacked with what the captain of the lightship thought was appendicitis. The radio operator on the lightship sent out an SOS call, which was picked up by the radio station at Cape May and flashed to Captain R. C. Weightman of the coast guard cutter "Kickapoo." The message said: "Bring a physician to the lightship." Dr. V. M. d'Marcy, veteran of the World War, volunteered. The "Kickapoo" proceeded down the coast. Dr. d'Marcy was put aboard the lightship and found that the sailor's condition required an immediate operation to save his life. The "Kickapoo" then steamed under forced draft to the Delaware Breakwater, where Captain Lynch of the Lewes Coast Guard Station transferred the sick man to the hospital. Word was received at Cape May by radio that the operation was a success.

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Radio and the Woman

By Crystal D. Tector

FRIEND Husband the other day came home real early and when questioned by yours truly concerning the reason, said that he was going to try a new aerial and the Beverage System as he heard that a man in town had had such wonderful results. So he put on his working clothes (a pair of torn and disreputable overalls, sneakers and a cap that he wears when he "puts the car in order") and started in climbing around the roof. I was inside making his favorite layer cake and paid no attention, as he generally gets an idea once in a while and then you can't do anything with him until he is either tired out or so disgusted with it that he refuses to work on it any more. An hour passed and no sign of friend husband, outside of a lot of noise on the roof. Suddenly, a yell and I saw a bunch of shingles come sliding down to the yard with a bang. I rushed outside and found F. H. very scared hanging on by the edge of his trousers to the roof, upside down. Perfectly safe, but looking ridiculous. After getting a ladder, and sending for the town builder to put a new roof on, he vehemently swore that "The next time that I try to put an aerial on the roof, I am going to stay on the ground to do it. Imagine what Dr. —— and his wife next door must have thought! I looked perfectly ridiculous." "That is all right," say I, "but I think that the Doctor must have been disappointed when you arrived safe and sound. Well, such is life—it's filled with disappointments."

* * *

FRIEND HUSBAND'S boss gets a "soft spot" every once in a while, and sort of "weeps for the world" according to hubby, and then simply can't hear any sad story. Last week was one of his "conscience" periods, and he heard of a blind asylum which needed help. So he took Friend Husband into his plans and thought that besides giving money he would donate a talking machine for their entertainment. "Talking machine! Why don't you be up-to-date and get them a radio receiver? It will give them more fun and it doesn't need so much care," said my hubby. "By Jove, you're right! Go out and get them one right away, bring it back and we'll take it up. You know more about those things than I do, so draw a check and go ahead." Well, friend husband went out and bought a nice little loop set, batteries and all, and brought it in to let the boss see it. He said the boss decided that he would take that one home to play with and made him go and buy another for the donation. Well, it's the old story. You can remain immune just so long, but when you fall you fall hard and quick. That's just the way with radio fans—they don't realize what they are missing until the little innocuous bug bites them and then they're gone for good.

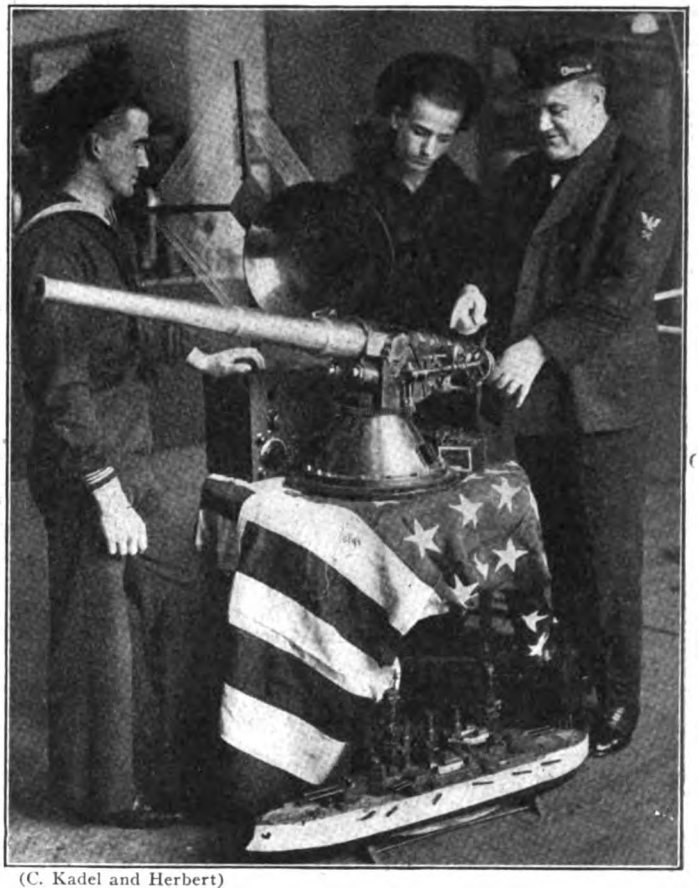
* * *

Girls, the editor asked me to publish a paragraph this week asking why some of the women don't write in for the DX Nite Owls. Surely some of us must be able to at least beat some of those "radio golf hounds." I know that my record is a mean one to look at, and I am going to put it in next week to start it along. Now who is going to follow me up?

* * *

Some people are so impossible that it makes me believe that a babe in arms has more common sense than they have. The other evening the phone rang and my husband's friend, who prides himself upon the fact that he is really handy and besides that calls himself an electrician, asked if he could bring his set over and show it to us, that something was wrong and all his bulbs had lit up bright and then gone out, and he couldn't light them up any more. When he came over he said that he had put in a new set of batteries and connected them up and then the bulbs had gone out. Well, he had connected the B batteries to the same posts as the storage battery, and consequently "blown" all his bulbs. Well, we could not make him understand why he shouldn't have done it, and his constant argument was, "Well, isn't it a battery, just the same? Why should I have to buy new bulbs just because I connected them wrong?" I wonder if his wife ever asks him to post a letter?

Radio Lecture Explained By Gun Model



(C. Kadel and Herbert)

A lecture on gunnery is being broadcast. The lecture is received on a loop receiver, and by the use of a small model a demonstration is being given to future gun pointers. The illustration shows Chief Petty Officer A. L. Whalen explaining the lecture to R. P. Smith and M. O. Trunnel, assisted by the radio receiver in the background.

* * *

Did you hear Romeo and Juliet broadcast last week? I was having the grandest time listening in to it, when F. H. woke up out of his after dinner snooze, looked at me a second, and then with a wry face, said: "Turn that Bla Bla off! It reminds me of the first time that I sat in the moonlight without my hat, and felt foolish." Well, I like that! He told me that I was the "one and only." Well, I've got him now, and that's all that counts.

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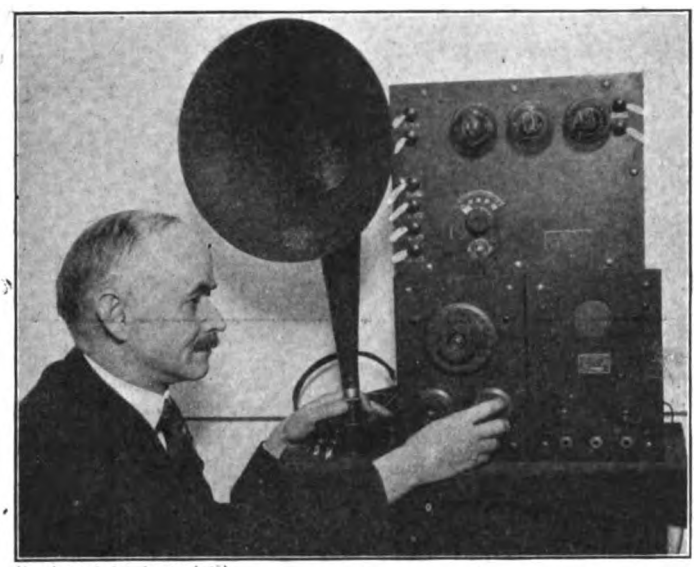
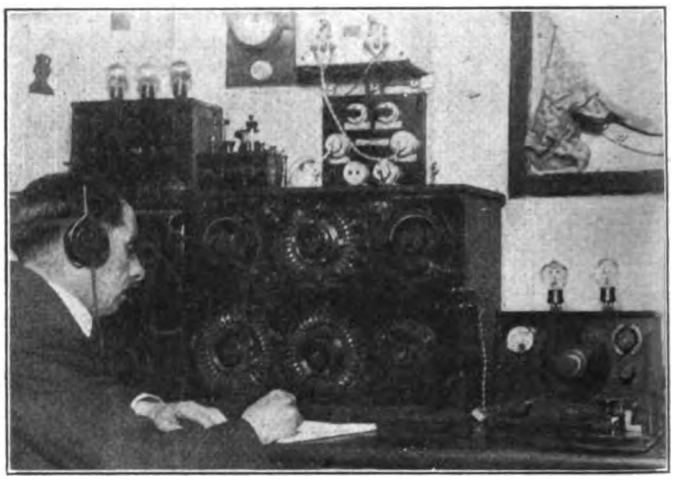
Lens and Plate Record Pict
The Latest Ra
Captions by Rober

(C. Kadel and Herbert)
The way they relieve the "waits" between trap shooting tournaments at Rye, N Y. Paul Von Boeckman, Mrs. B. Peel and A. F. Stillson using a loop receiver to enjoy the broadcasting during a lull in the activities.



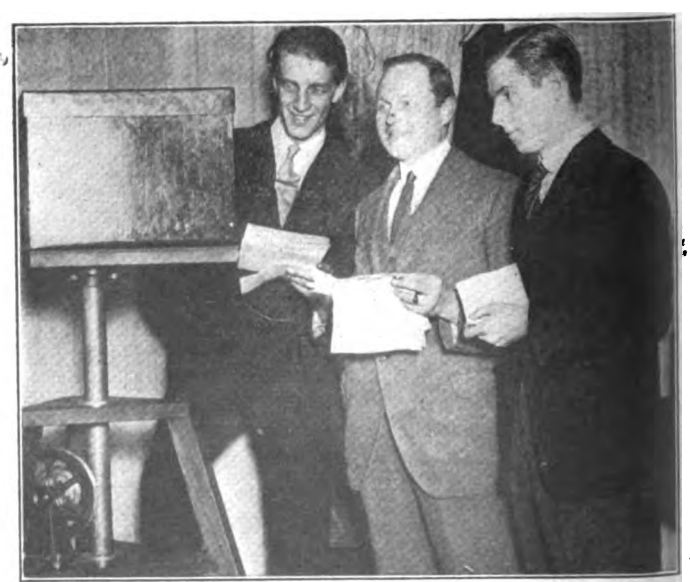
(C. Keystone View Co.)
Judge Ben Lindsay, noted jurist, who knows "every bad boy" in Denver, enjoying a few minutes rest listening in on his Westinghouse R. C. receiver. Judge Lindsay is a great believer in the efficacy of radio as a corrective for "bad boys."

(C. Underwood and Underwood)
Rt. Rev. Herbert Shipman, Bishop of the Episcopal Diocese of New York, broadcasting a pre-Easter address direct from the stage of the Palace Theatre, New York.



(C. Photonews, N. Y.)
Interior of the "radio shack" of the S. S. "Rochambeau." The set is a five tube receiver, employing the heterodyne principle, with three stages of amplification and a wave range up to 24,000 meters.

(C. Wide World Photos)
Elsie Janis, well-known comedienne, listening to an organ recital in New York while in Paris.



(C. Underwood and Underwood)
A group of well known English broadcasters entertaining the children. The large transmitter used is quite unlike our small compact ones.

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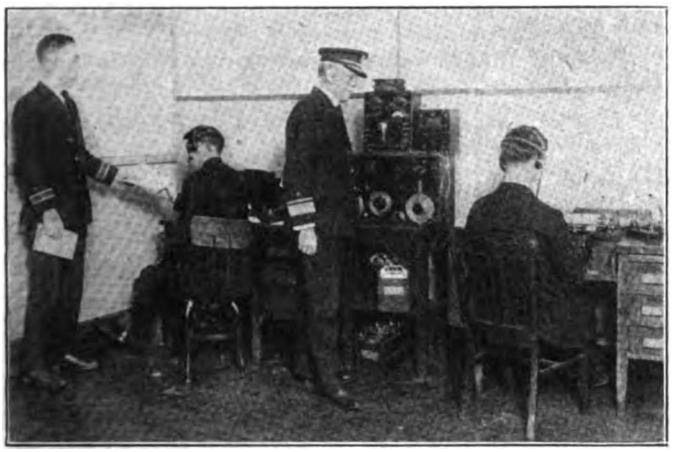
rdictorially for Our Readers eeRadio Events

ert L. Dougherty



(C. P. and A. Photos)
Admiral Ziegermeier, Chief of the Bureau of Naval Communications, inspecting the new receiving station of the department that will handle transatlantic communications.

(C. International Newsreel Photo)
London butchers have gone us one better by installing receiving sets in their stores to attract customers and keep their minds off the butcher's hand while weighing the lamb.

(C. Photonews, N. Y.)
Hope Hampton, noted screen actress, has been bitten by the radio bug, and has even made her own receiver. Miss Hampton is shown soldering tops, which is harder than "Exit languidly. Shoot!"

(C. P. and A. Photos)
Lester Picker, of the San Diego, Cal., High School, has the distinction of being the first student in the country to be graduated by radio. He is shown listening in to the graduation exercises which were broadcast.

(C. International Newsreel)
King Emmanuel, of Italy, listening in on some special tests arranged by the Italian Army to determine the advisability of broadcasting army orders and information.

(C. Keystone View Co.)
Theodore Roosevelt's kiddies listening in on their De Forest loop set. Teddy, Jr., acted as operator while the photographer snapped them. Col. Roosevelt is an ardent fan himself, as are most men of affairs these "radiotic" days.

Answers to Readers

ENCLOSED find a diagram showing my present set, which is a regenerative with two steps of amplification. Kindly publish or refer me to where I can obtain a hook-up of a step of radio frequency to go before the detector.—B. L. Bailie, 7720 Plymouth Road, Detroit, Mich.

We refer you to RADIO WORLD for February 24, 1923, where you will find the diagram you require, in answer to a similar inquiry by Mr. Beckhouse. You state that you have two stages of audio frequency, while the diagram has only one. This is of little consequence, as you will not have to change your present amplifer unit hook-up at all, it only being necessary to change the circuit in front of the detector, which is simple.

* * *

1. Does it matter if the antenna is allowed to sag in the center? Would the signals be any stronger if the wire were stretched tight?

2. My antenna runs through the branches of trees. Would this cause the signals to fade out? The batteries are all new, and the set is a Westinghouse Type RC.

3. Is it necessary to have the lead in end of the antenna lower than the other end of the antenna, or should they be the same height?—Chas. E. Stevens, M. D., Bessemer, Michigan.

1. It will not affect the strength of the signals if the wire is sagged.

2. We cannot understand how the antenna running through the branches of the trees would cause the signals to fade, but advise you, however, to place your antenna where it will not have to run in this fashion, as experiments have proved that trees have the power to absorb energy and will therefore tend to decrease that received signal strength. Examine your ground connection and see that your antenna is well insulated. The fading might possibly be from the antenna swinging against the tree and then swinging back again.

3. It is not necessary to have the lead in end of the antenna lower than the other end. They may both be the same height.

* * *

1. What size wire and how many turns should be used on the coils described by F. J. Rumford in his article on the Satterlee circuit?

2. What condensers should be used in the antenna and secondary circuits?

3. Do two separate wires run from the antenna binding posts to each of the coils separately, then through the coils and finally from the end of the coils to the ground post; or are the coils connected in series to the ground?—George J. Schretter, 200 Tyson Street, New Brighton, Staten Island, N. Y.

1. These coils are wound pancake form, and consist of 100 turns each for the outside coils. They should be wound with about No. 22 DC wire.

2. The condensers used are .0005 in the primary and .001 in the secondary circuit.

3. These coils are connected in such a manner that they are in parallel, which is exactly as the diagram has them. The selectivity of this set is due to this. Also, there is no antenna needed when a ground is used, or vice versa. If you use an antenna you do not need a ground, and if you use a ground you will not need an antenna. In nearby reception over a distance of 25-40 miles no antenna or ground is necessary, the set itself being all that is required for good reception.

* * *

1. Is the WD-11 tube of any use for radio frequency?

2. In the circuit described by Mr. P. F. Albright, what principle is used? The circuit doesn't appear to be regenerative although the results seem to show that he is getting regeneration.

3. What is the Ultra Audion circuit or receiver?

4. Would anything be gained by using a tube detector instead of the crystal in the three tube reflex circuit published on March 3 by W. S. Thompson?

5. How many stages of radio frequency would be necessary to secure the same audibility that I now get through regeneration?

6. Using a fixed inductance of about 70 turns, on a 2½-inch tube, what should be the wave length range using a .0005 variable condenser, also using a .001 condenser?

7. How is the tuning governed in the set asked about in Question 2?—A. Leslie, Twin Falls, Idaho, P. O. Box 1056.

1. While the WD-11 tube can be used for radio frequency, it is not advisable because of the fact that not sufficient volume will be noticed in the strength of the signals. These tubes were not made for radio frequency, and should not be used for it. They will work, but not satisfactorily.

2. Regeneration is the principle, getting back-coupling from the plate much the same as in all the single circuit regenerative circuits.

3. The Ultra Audion method of reception, was discovered by Dr. Lee de Forest, and embodies the principle of directly coupling one side of the secondary circuit to the plate.

4. In the circuit you mention, you would of course gain some volume of sound but this would be discounted by the distortion which would be noticed. Crystal detection is ideal, and should be used in reflex circuits whenever possible.

5. This is a blind question and cannot very well be answered, as the amount of volume varies with different constants such as kind of tube, transformer, etc. But you will be disappointed if you do not at least use two stages, as with one stage no appreciable difference in distance or clearness can be noticed.

6. The wave length range of this coil when used in parallel with the .0005 condenser will be approximately 300-750 meters and with the .001 condenser it will be about 300-1400 meters. This is of course an approximate calculation, and does not take into consideration the actual length of the antenna used.

7. The tuning is accomplished by means of the rotor of the double wound coupler, the construction of which is shown in the sketch.

* * *

1. Compared with the WD-11 tubes, how are the "Midget Peanut" 3 volt tubes?

2. Can these tubes be used with Ortherus Gordon hook-up?

3. Will these tubes stand 45 volts on the plate?—Edgar L. Miller, 2353 Payne Street, Louisville, Ky.

1. We do not compare various makes of competive apparatus in this column; so we cannot, therefore give you the information that you desire on this point.

2-3. These tubes can be used in the Gordon circuit and they will stand the voltage you name, although it is not necessary to use 45 volts on the plate to get them to work their best. Harm is done by using more plate voltage than is necessary and by burning the filament high, than any other method of disuse. The wise user will operate his tubes on as low plate and filament voltage as he can efficiently.

* * *

Where can I obtain blueprints of circuits described in your issues by W. S. Thompson and Frederick J. Rumford?—K. H. Pettit, care Choctaw Telephone Co., Soper, Okla.

We do not handle blueprints of these circuits, but if you will communicate with the writers you mention, through RADIO WORLD, we will see that the letters are forwarded.

* * *

Give me a hook-up for the following apparatus: 23-plate condenser, variometer, loading coil, switch, tube, etc.—Joseph Honnors, 134 Wheeler street, Gloucester, Mass.

We refer you to RADIO WORLD for February 17, 1923, where you will find a circuit such as you desire on page 11 under the heading "A Hook-Up That Is a Wonder," by George W. May.

* * *

Where can I obtain information on the reflex circuit published in RADIO WORLD for February 17, 1923, by C. White?—K. L. Hathaway, 3157 Maple street, San Diego, Cal.

If you will address a letter to the writer of the article in care of RADIO WORLD we will see that it is forwarded to him.

Assistant Examiners Wanted for the Patent Office

THE United States Civil Service Commission announces that an open competitive examination will be held throughout the country on May 9, 10, and 11. It is to fill vacancies in the Patent Office at Washington, D. C., at an entrance salary of $1,500 a year, plus the increase of $20 a month granted by Congress. There is provision for promotion to positions paying as high as $3,900 a year. In addition to present vacancies, 43 new positions are authorized, effective July 1.

Competitors will be examined in the subjects of physics, mechanical drawing, technics, mathematics, language (French and German), and optional subject. Applicants must select one of the following optional subjects: Electro-chemistry, general chemistry, or chemical, civil, electrical and mechanical engineering.

On account of the urgent need for assistant examiners, the examination papers will be rated and certification of eligibles made within the shortest possible time after holding the examination.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the Board of U. S. civil service examiners at the post office or custom house in any city.

Business Will Continue to Be Good

THE recovery of business from the depression of 1921 has proceeded normally, in spite of the European unsettlement, and good business may be expected throughout 1923, according to a report made public by the Harvard Economic Service, at Cambridge, Mass., last week. The outlook for the rest of this year is further expansion of business, firm or higher commodity prices, and firm or higher money rates.

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United States Stations Heard in Cuba

Frank H. Jones, a radio enthusiast of Tuinucu, Cuba, is well-known in the radio world for this enthusiast has brought in nearly every broadcasting station in the United States. Each night he listens-in regularly to such stations as KDKA, the Westinghouse station at East Pittsburgh, WJZ, the Westinghouse-Radio Corporation station at Newark, N. J., Davenport, Iowa, Chicago, or any of the so-called big stations.

Recently Mr. Jones wrote to the Westinghouse Electric International Company's Cuban office in Havana telling how he obtains such good radio records.

His letter is so interesting that excerpts from it will be worth while reading for any amateur:

"With the R. C. set (the Westinghouse single circuit tuner with two stages), on the detector tube alone I have heard over 100 United States, Cuban and Porto Rican radio telephone stations. My radio golf score now stands at over 100,000 miles. Ordinarily I use an antenna with the R. C. set although with a four foot loop, not shown in the photograph, connected with one side to the antenna post of the R. C. set and the other end free and using a ground, I have heard KDKA, WGY, and other stations with the detector tube alone.

"The set underneath the R. C. I made myself. The four dials at the left are various condensers and tapped inductance. Knobs in center are attached to three radio frequency amplifier 201 tubes and two potentiometers. Towards the right is a complete three circuit regenerative tuner with variocouplers, grid variometer and plate variometer; then the detector tube and its rheostat and phone jack.

"In this set I can use (by throwing various switches inside the cover of the set) the following:

"(1) Antenna with three stages radio frequency amplification and detector.

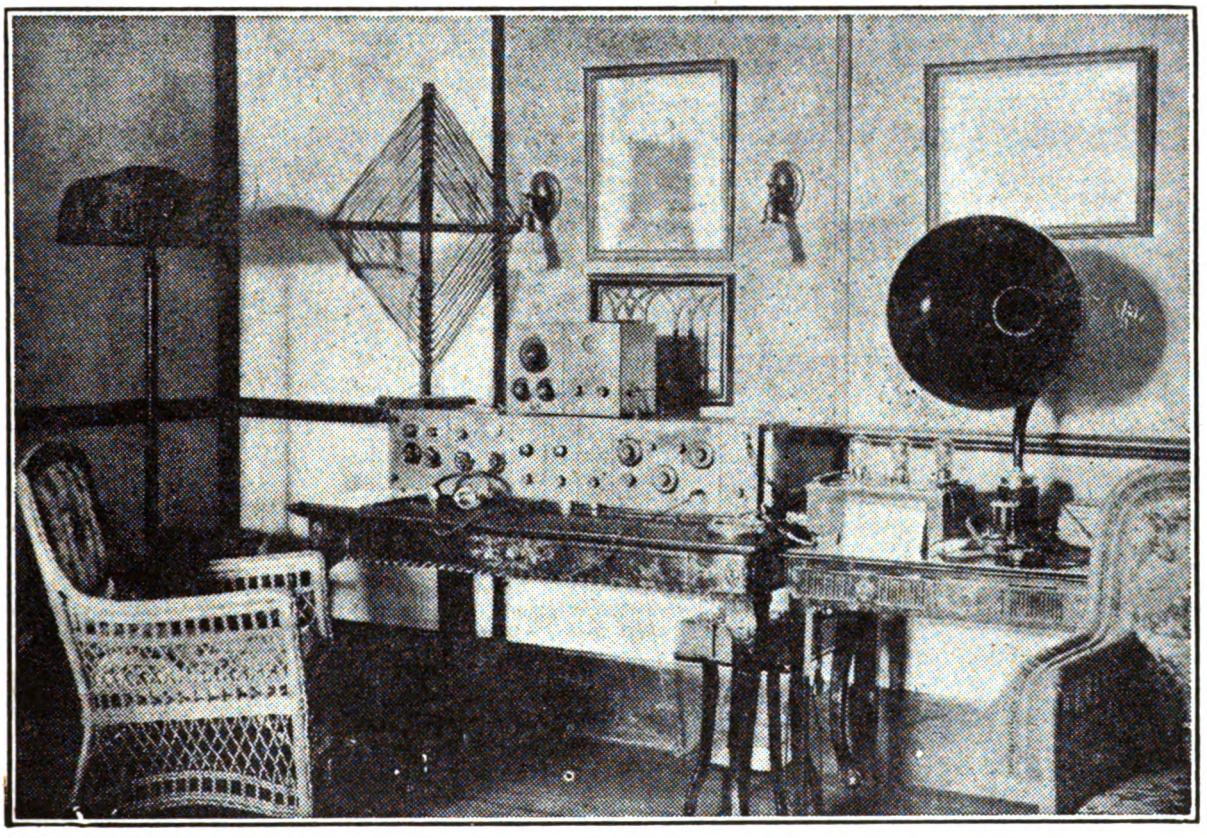
"(2) Antenna with triple coil honeycombs inside set with three stages radio frequency amplification and detector.

"(3) Antenna and three circuit regenerative receiver and detector.

"(4) Antenna and three stages of radio frequency amplification and regenerative circuit combined.

"(5) Eighteen inch loop shown on top of set with three stages of radio frequency amplification and detector.

"Inside the set is an audio frequency transformer for coupling the detector tube to the magnavox amplifier."



Frank H. Jones' radio receiving station at Tuinucu Cuba, which regularly picks up United States broadcasters.

Radio Club of Brooklyn, N. Y.

THE Radio Club of Brooklyn, N. Y., the oldest and foremost radio club in that city, is now well in its eighth year of progress. It is the representative radio club of Brooklyn, and an important factor in Brooklyn's amateur radio. It numbers among its membership many famous in radio engineering and amateur DX.

At its last meeting plans were presented for the club's annual affair. It promises to be a merry occasion, and a good time is assured all who attend. Further announcements regarding this will be made later.

All complaints of amateur interference should be addressed to this club, since it has been authorized by the Executive Radio Council to take care of such affairs. These complaints should comprise Brooklyn only. Matters in other cities should be addressed to the local clubs.

Meetings are held the second and fourth Fridays of the month at 2211 Bedford avenue, near Church avenue, at 8:30 p. m. A cordial invitation is extended those interested in amateur radio to visit the club. Communications should be addressed to the secretary, D. F. Kirchick, 409 Osborne street, Brooklyn, N. Y.

Beware Buying This Stolen Radio Apparatus!

THE Edward J. Goetz Co., 47 Cambridge Building, Cincinnati, Ohio, requests RADIO WORLD to notify the industry that the company's warehouse, at 2409 Harris avenue, Norwood, Ohio, was burglarized recently, and the following merchandise stolen: One F. R. L. super set, one Firth Vocatone, one Edgco de luxe set, one Magnavox, two Bristol loud-speakers, and a considerable number of small radio parts.

Dealers are requested to be on guard, and if any of the merchandise mentioned is offered to them to notify their local police authorities, as well as the owner of the goods.

WGY Spells Schenectady, N. Y.

CORRESPONDENTS of WGY, the General Electric Company's radio broadcasting station at Schenectady, N. Y., frequently have trouble in spelling the name of the city. English radio fans generally address "General Electric Company, New York," and make no attempt to spell "Schenectady." A five-year-old boy living at North Hoosick, Mass., has happily solved the problem according to the following which appeared in a Massachusetts newspaper:

"Fred Stevens, of North Hoosick, picked up the five-year-old son of Ira Fisk, and gave the boy a lift on the way to school. The juvenile Fisk is noted for his brightness and Mr. Stevens began a quiz. The youngster, of course, spelled 'cat' and things of that kind without any trouble, but Mr. Stevens thought he put a poser when he asked the boy if he could spell 'Schenectady.' 'Sure,' was the prompt response, 'WGY.'"

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Latest Radio Patents

Radio Transmission Control System

No. 1,447,773: Patented March 6, 1923. Patentees: Lloyd Espenschied, Queens, N. Y., and Ralph Bown, East Orange, N. J.

This invention relates to radio signaling, and more particularly to the control of the level of transmission in such signaling. While it will be described as applied especially to radio telephony for the reason

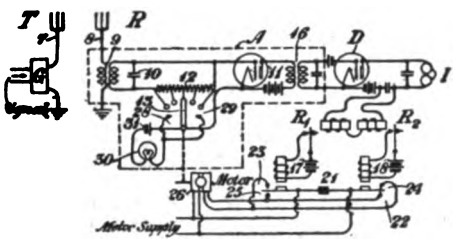


Diagram of Espenschied and Bown's Radio Transmission Control System.

that the need is greatest in that field, it is to be understood that it may be applied equally well to telegraphy, or the transmission of any other signals. Its object is particularly to improve the constancy of transmission characteristics in radio communication.

In radio signaling there are present to an enormous extent variations in the transmission characteristics which render it difficult to obtain satisfactory signal conditions and which result, among other things, in large fluctuations in the volume of a telephone or other message being transmitted. These variations may be due to such well known phenomena as "fading away" or to differences in day and night signaling. Or, again, they may be due to changes in the apparatus, either at the sending or receiving stations. If, in long-distance radio transmission, repeater stations are used further possibilities for variations enter. These variations may be sudden or slow, depending on their origin, but in any case detract materially from the effectiveness of radio communication.

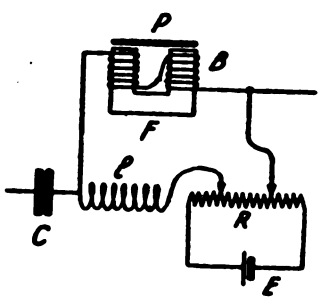
In our invention we propose to overcome the effect of these variations by providing compensating means, preferably automatic, and in general, to accomplish this we virtually set aside a signal channel which may be considered as a "pilot" channel over which shall come information as to the transmission character of the ether path through which the signals come.

Radio Receiving System

No. 1,447,793: Patented March 6, 1923. Patentee: Marius Latour, Paris, France

The present invention relates to improvements in circuit arrangements of radiotelegraphic receiving stations for the purpose of increasing the sensitiveness of the receiving and making possible the application of the principle of heterodyne action in the reception of Hertzian waves.

As well known, in the case of crystal detectors, the rectified portion of the current is proportional to the square of the alternating potential v acting on the circuit comprising the detector. On the other hand, if a potential V of a slightly different period is introduced into the receiving circuit it is found that the sensitiveness of the receiving increased with the potential V up to a certain limit.



Latour's Improved Radio Receiving System.

It has been found advisable to increase V until the law of the square no longer holds good and up to a point beginning at which the rectified portion of the current is simply proportional to the potential applied to the detector. The increasing of V above this value will be useless.

The only difficulty that will be encountered in increasing V will be the presence of a permanent rectified current in the telephone. This permanent current will cause the permanent attraction of the diaphragm that may cause a lowering of the sensitiveness of the telephone. As a result of this, beginning with a certain value for V, the increase in sensitiveness corresponding to the increase of V will be concealed.

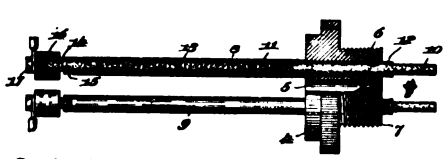
This disadvantage may be remedied in the following simple manner:

A simple expedient is to use telephones provided with magnets of lower magnetization. The permanent rectified current would only add its effect to the magnetism of the magnet to supplement its insufficiency and produce the necessary permanent induction under the diaphragm. It is also conceivable that we may operate without a permanent magnet and use only the rectified current for producing the necessary permanent induction.

Flexible Electrode

No. 1,447,357: Patented March 6, 1923. Patentee: David R. Price, Newtonville, Mass.

This invention relates to an improved non-corrosive and flexible electrode. While adapted for general use wherever



Sectional View of Price's Flexible Electrode.

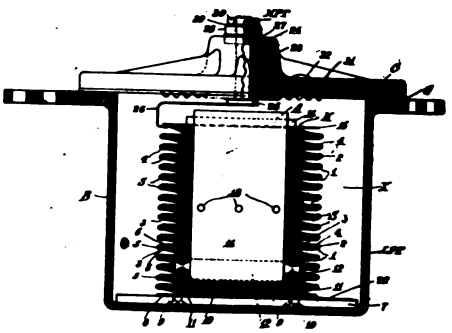
electrodes of such characteristics may be desirable, it is of particular application in connection with the device for determining the liquid level in storage batteries which I have described and claimed in application Serial No. 358,495, filed on even date herewith. In the construction of an electrode for use in connection with storage batteries or the like, the electrode must be constructed of material inert in sulphuric acid or in similar electrolytes. Storage batteries give off fumes from the electrolyte, especially during the charging of the battery, which fumes are highly corrosive in action so that it is essential that the connection of the usual metallic conductor to the electrode take place at a point relatively remote from the point of discharge of the fumes. In order to carry out this last requirement it is highly desirable that the electrode itself be flexible since storage batteries are very generally located in restricted spaces. A solid electrode extending away from the battery proper would be easily broken and therefore unreliable.

It is an object of my invention to provide a flexible electrode formed of material which is normally inert in sulphuric acid or similar electrolytes and to provide such an electrode which may be easily and cheaply constructed of material which may be readily obtained. It is also an object of the present invention to provide a new and improved method of forming and assembling such electrodes.

Electrical Condenser

No. 1,446,850: Patented Feb. 27, 1923. Patentee: Byron Macpherson, Roxbury, Mass.

THIS invention relates to improvements in electrical condensers of the plate or sheet type, especially of the type wherein the condenser is divided into sections and the sections connected in series for high potential service, although not limited to series condensers; and the invention consists of certain improvements in the means for clamping the stack. This application is a continuation in part of my application Serial No. 301,498, filed June 3, 1919.



Sectional View of Macpherson's Electrical Condenser.

My invention is especially applicable to the type of stack in which the two ends are at a difference of potential and is embodied preferably as an insulating clamp; that is, a clamp in which the two ends of the stack are connected by a member comprising insulating material. An advantage of my form of clamp resides in the fact that the capacity of the condenser remains constant with time and use.

This clamp in particular comprises metallic end blocks or members engaging the ends of the stack, and a flexible band of insulating material connecting the members and drawing the same into clamping relation against the ends of the stack, the ends of the stack being at high potential differences.

Improved Dial Knob

No. 1,445,812: Patented Feb. 20, 1923. Patentee: Charles P. Whitall, Longmeadow, Mass.

THIS invention relates to dial knobs such as are used for adjusting various rotatable parts of radio apparatus. The invention has for its object to provide an improved molded dial knob of light but rugged construction and of distinctive and pleasing appearance and one which is particularly well adapted for economical quantity production. The invention consists in the novel and advantageous features employed.

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The DX Nite Owls

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

Fine Stuff! Send 'Em in Men, Send 'Em in!

From Maxwell Davidson, Jr., Lawrence, L. I.

BEING a constant reader of RADIO WORLD and buying it weekly, I have noticed the column devoted to the DX'ers. I have not noticed many amateurs listed, however. I am sending my list for the period of time I have had my Grebe CR-9 (four months), and, if it is not imposing, I would like particularly to see my list published. I find a 43-plate variable condenser in series with my ground aids selectivity.

Local and DX—WJZ, WOR, WBS, WBAN, WAAM, WIP, WOO, WFI, KDKA, WEAF, WHAS, WSB, WHN, WGI, WGF, WGL, WGM, WGY, WOC, KYW, WHAZ, WBZ, WHK, PWX, WWJ, WHB, WDAP, WPI, WMAF, NOF, NAA, NAH, CFCA, WLW, KSO, WBAP, WPA (Texas), WBT, WCAU, KOP, WQAA, WIAO, WLK, WNAC, WWL (Louisiana), WDAJ, WLAG, WRW, WOH, WHAM, WCAE, WUP, WJAX, WEAO, WMAK, WDAF, WSY, WMAQ, WQAO, WMC, WIAR, WOAX, WDAL (Florida), WWAD, CFCA, CHYC, CKAC, WAAP (Kansas).

AM—IXB, 2AYZ, 2BUM, 2EL, 2PB, 2CLO, 2BQU, 2BY, 2AZY, 2ZL, 2BDF, 2BWU, 2ACY, 2OE, 2AFM, 2BUA, 2ABA, 2ACB, 2CPD, 1BKA, 1RI, 1BEF, 2ABD, 2AWL, 2CPW.

Grand total, 93. Can prove all with data and date. Would like to communicate with any Grebe 9 owner.

* * *

"Out Where the West Is"

From Pat Ewing, Hardin, Montana.

I AM a subscriber to RADIO WORLD and enjoy the DX Nite Owls very much. Here are some of the stations I get on a detector tube: Atlanta, Havana, New York, Chicago, San Francisco and Canada. We all get 1,500 miles or better out here (where the West is) every night. Any fan that does not have a loud-speaker might try this one: Put phones in coffee cups and note the results. I have a house full of music every night with detector tube, 2,000-ohm, head set and coffee cups. Try it.

* * *

Gotta Show Us Y'Know!

From H. R. Graf, Jackson, Mich.

AS a reader of the RADIO WORLD and especially interested in the "DX Nite Owls" records, I am sending my record of 24 stations in one evening from 7:00 to 9:00 o'clock P. M.

They are as follows: St. Louis, KSD; Chicago, KYW; Detroit, WWJ; Schenectady, WGY; Pittsburgh, KDKA; Kansas City, WHB; Newark, WJZ; Memphis, WMC; Davenport, WOC; Louisville, WHAS; Paducah, WIAP; Birmingham, WSY; Detroit, WCX; Fort Worth, WBAP; Pittsburgh, WCAE; Winnipeg, Ont., CJCG; College Park, WDAJ; New York, WEAF; Minneapolis, WLAG; Lockport, WMAK; Chicago, WMAQ; Boston, WNAC; Jefferson City, WOS; Atlanta, WSB. In all I have heard 75 stations. The farthest is Honolulu, Hawaii, KDYX, about 4,800 miles. I am using a tickler circuit and one-stage of audio-frequency, which I constructed.

* * *

Auburn Come in QSA

From Ora Lyons, 803 Main St., Auburn, Ind.

I READ in a recent issue of RADIO WORLD an article relative to the distance of a single-circuit detector tube set. I am using the above circuit and receive the Los Angeles, Cal., station, KHJ; Winnipeg, Canada, CJG; Dallas, Texas, WFAA; Fort Worth, Texas, WBAP; Newark, N. J., WOR; Atlanta, Ga., WGM; Havana, Cuba, PWX, as well as several intermediate stations. Mr. Guy Fitzsimmons constructed the hook-up which I used in tuning in for the above named stations. Mr. Fitzsimmons lives in Auburn, Ind. My aerial is 18 feet high and 50 feet long.

* * *

California Registers WOW!!

From Earl Kauffman, Clovis, Calif.

I NOTE with amusement the challenges of Mr. Lindstrom, of Baraboo, Wis., regarding his hearing voice and music from all over the United States. Why shouldn't he? He is in an ideal location, and time is in his favor. If Mike Podhorn (old tinhorn), of Wood River, Ill., isn't getting like results from his ideal location would advise him to discard his expensive set and make himself a *good* one.

Time is against us for receiving eastern stations. However, we hear WLW, WGM, KDYL, KZN, WDAF, WOZ, WOAJ, WCAT, KSD and PWZ Wednesday and Saturday nights from 6 to 7:30 p. m., Pacific Time. This on one-step audio-frequency. Also want it understood there is nothing to patent about this set, but it has a vernier condenser, without which no one can expect to tune in anything and know what he is going to tune in. Use a spider-web coil for a secondary in a Remler style, tapped vario-coupler. Two sets of head phones are used, and can substantiate every station named by reliable witnesses.

* * *

One WD-11 Without Amplification

From O. E. Slaybrough, 2853 Shriver Ave., Indianapolis, Ind.

I HAVE been reading the records of the "DX Nite Owls" in RADIO WORLD and I am sending my list for the night of March 9. All stations were received on a single-circuit regenerative set, built by myself using one WD-11 tube without amplification.

WLAG, Minneapolis, 500 miles; WOC, Davenport, Ia., 285; WCK and KSD, St. Louis, Mo., 260; WIAR, Paducah, Ky., 270; WGY, Schenectady, 685; WBAO, Dallas, Texas, 805; WDAJ, College Park, Ga., 355; WSB and WGM, Atlanta, Ga., 345; WOS, Jefferson City, Mo., 345; WSY, Birmingham, Ala., 460; WDAF, Kansas City, 490; WMC, Memphis, Tenn., 385; KDKA, Pittsburgh, Pa., 345; WMAQ, WDAP and KYW, Chicago, Ill., 200; WAAP, Wichita, Kan., 635; WBAA, West Lafayette, Ind., 60. KFI and KPK, Los Angeles, Cal., 1,895; KFDL, Denver, Col., 1,005 miles.

(*Continued on page 24*)

Why Magnavox *is* the Reproducer Supreme

OFFICIAL tests with the oscillograph prove that the Magnavox electro-dynamic receiver reproduces incoming wave forms with maximum accuracy.

The Magnavox can be used with any receiving set—the better the set, the more Magnavox can do for you.

When you purchase a Magnavox you possess an instrument of the very highest quality and efficiency.

R2 Magnavox Radio with 18-inch horn
(as illustrated)

This instrument is intended for those who wish the utmost in amplifying power; for clubs, hotels, dance halls, large audiences, etc. It requires only .6 of an ampere for the field. Price, $60.00

R3 Magnavox Radio with 14-inch horn

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R2. Price, $35.00

Model C Magnavox Power Amplifier

For use with the Magnavox Radio and insures getting the largest possible power input.

2-stage, $55.00
3-stage, $75.00

Magnavox products can be had of good dealers everywhere.

THE MAGNAVOX CO.
Oakland, California
N. Y. Office: 370 Seventh Ave.

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Radio Merchandising

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Congratulations from a Competent Authority

Editor, RADIO WORLD:

Upon the occasion of your special anniversary number of RADIO WORLD, I am happy in the opportunity to congratulate you on the tremendous strides which your publication has made in its first year.

Your own unfailing courage and the energy and devotion of your associates have given us a weekly radio publication that many thousands of us in radio deeply appreciate.

You have the best wishes of everyone of us in the Sleeper Radio Corporation for a big prosperous new year and many years like it to come.

Cordially yours,
GORDON C. SLEEPER.

New York,
March 28, 1923.

New Nantucket Lightship to Have Radio

THE present Nantucket, Mass., lightship will be displaced by the latest and best equipped lightship in the service about the first of June, according to the Commissioner of Lighthouses. Inbound transatlantic liners will be greatly aided against the dangers of fogs and the treacherous shoals in these waters by the installation of a radio signal set capable of communicating with ships within a hundred miles of the shoals. The present lightship has no radio service and during foggy weather the light is not discernible. When the radio signaling apparatus on the new lightship is installed inbound liners will be able to get their bearings in all kinds of weather.

Secretaries of Radio Clubs, Attention!

THE secretaries of radio clubs throughout the United States are requested to send to RADIO WORLD any news of interest to other radio enthusiasts which may come to their notice at club meetings or elsewhere. RADIO WORLD desires to co-operate to the fullest extent with clubs and other organizations in all their progressive efforts.

RADIO WORLD SELLS FAST IN CALIFORNIA
RADIO WORLD is the best of them all. Your publication is all sold out on the local newsstands almost as soon as they arrive here.
HENRY FIEDLER,
1169 West 38th Place, Los Angeles, Cal.

New Radio and Electric Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given whenever possible.)

The Colorado Springs, Col., Radio Co., Inc. S. L. Maynard and others.

Haverford Cycle Sales Co., 522 Tenth St., N. W., Washington, D. C., is adding a radio department.

Keller Radio Co., 9 South St., Belleville, Ill. C. J. Keller, proprietor.

Atlas Radio Store, 345 South Clark St., Chicago, Ill.

Congress Radio Co., Congress and State Sts., Chicago, Ill.

Triangle Radio Store, Robey, Lincoln and Irving Park Boulevard, Chicago, Ill.

V. B. Thompson, Girard, Ill. Adding radio department.

J. O. Hank, Newton, Ill. Adding radio department.

Radio Club, Inc., Laporte, Ind. C. M. Cooke and others.

Eden Bros., Ainsworth, Ia. Adding radio department.

Hawkeye Radio & Supply Co., 505 Eighth St., Des Moines, Ia. A. J. Tingley and M. C. Haigh, proprietors.

Cut Rate Radio Co., Fifth and Quincy Sts., Topeka, Kan.

Washington Radio Supply Co., 802 Washington St., Boston, Mass.

Marle Duston Radio Co., 407 East Fort St., Detroit, Mich.

Guy Schweer Electric Co., East Franklin St., Clinton, Mo. Adding radio department.

Quade Auto Supply Co., Harrisonville, Mo. Adding radio department.

Main Radio Co., 3032 Main St., Kansas City, Mo.

Ligon-Renick Sales Co., Odessa, Mo.

Paramount Radio Corporation, 5135 Washington St., St. Louis, Mo. R. H. Cone and others.

Smith-Davidson Motor Co., Auburn, Neb. Adding radio department.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

RADIO AND ELECTRICAL EXPOSITION, including amateur home-made set contest, San Francisco, Cal., April 3 to 8, inclusive.

The Dictograd Radio Loud Speaker

THE Dictograph Products Corporation, 220 West 42nd Street, New York City, has placed on the market the new Dictograd radio loud speaker. It is mounted in a mahogany finished hardwood cabinet. An adjusting dial in the front of the cabinet regulates the air gap between the pole shoes and an especially made secret alloy diaphragm. The adjusting mechanism operates through a shaft, pinion and gear. Changing the air gap varies the pull of the magnet upon the diaphragm, thus enabling the loud speaker to be tuned up in complete harmony and resonance with the receiving set.

The Dictograd radio loud speaker is designed to operate on any vacuum tube receiving sets, using two stages of amplification, but good results are often secured on sets employing but one stage of amplification, dependent upon the type of set used and the distance from the broadcasting station. This loud speaker requires no external batteries. In its design and construction is concentrated 20 years leadership in the art of sensitive sound transmission. Dictograph experience in the manufacture of the Acousticon for the deaf, the secret service dictograph, and the Dictograph system of interior telephones, has enabled the production of this perfected radio loud speaker.

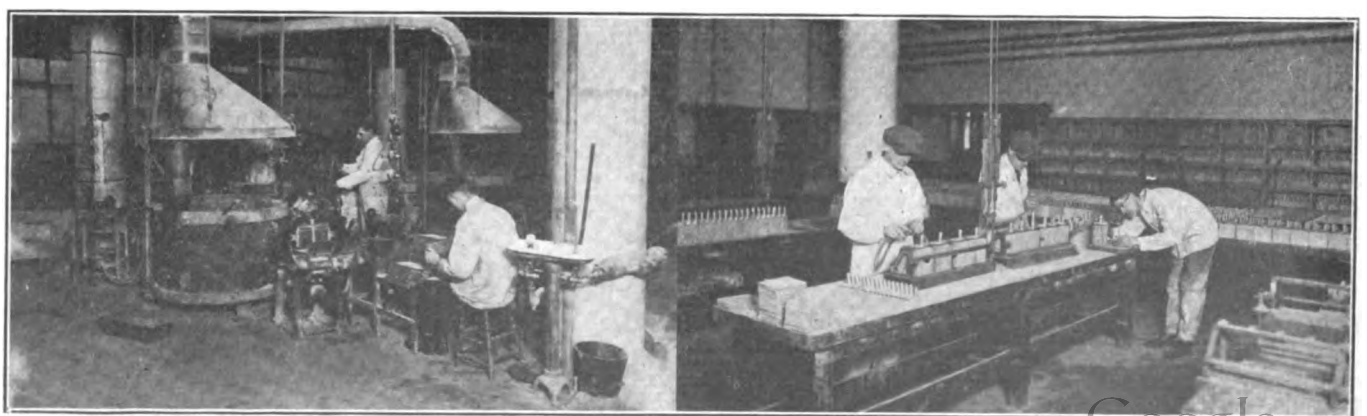
Crosley Produces "Radarios"

The Crosley Manufacturing Company, Cincinnati, Ohio, operating radio broadcasting station WLW, calls attention to their original and novel plays which they have christened "radarios." They are a creation of Robert F. Stayman, editor of the Crosley "Radio Weekly." Radarios will continue to be on the weekly programs sent out from the large station at Cincinnati. They were started some time ago and have proven very successful, as the written applause (telegrams and letters) testify.

International Travel Exposition

The second annual International Travel Exposition, will be held at Grand Central Palace, New York City, from April 9 to 14. Although many radio fans do their travelling through the ether, no doubt others will be interested in the exhibits and features of this exposition which have been gathered from the four corners of the earth.

Where Some of Your Storage Batteries are Made



Showing employees at work in two departments at the Westinghouse Union Battery Company, Swissvale, Pa.

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CROSLEY Model Vc
$20 Regenerative Receiver Set

Licensed under Armstrong U.S. Patent No. 1,113,149

There is no other one-tube set being manufactured today that will give better results than produced by the Crosley Model Vc Regenerative Radio Receiver. The proud owner of one of these instruments can bring in any powerful station in the United States. Stations more than 1,000 miles away are being copied regularly on this set. Equal in every respect to the guaranteed performance of this instrument are its finish and appearance.

The trade-name "Crosley" is used by permission of the Crosley Manufacturing Co.

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The Precision Equipment Co.
Powel Crosley, Jr., President
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You Never Heard Before

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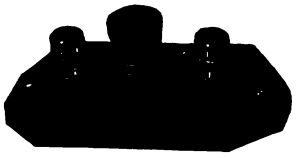

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Chas. Freshman Co., Inc.
106 Seventh Ave. New York City

A B C of Aviation

By CAPT. V. W. PAGÉ. This book describes the basic principles of aviation, tells how a balloon or dirigible is made and why it floats in the air. Describes how an airplane flies. It shows in detail the different parts of an airplane, what they are and what they do. Describes all types of airplanes and how they differ in construction; as well as detailing the advantages and disadvantages of different types of aircraft. It includes a complete dictionary of aviation terms and clear drawings of leading airplanes. The reader will find simple instructions for unpacking, setting up and rigging airplanes. A full description of airplane control principles is given and methods of flying are discussed at length.

This book answers every question one can ask about modern aircraft, their construction and operation. 275 pages, 150 specially made illustrations with 7 plates. Price, $2.50

THE COLUMBIA PRINT
1493 Broadway, New York City

Fifty-two issues for $6.00. Sub. De-

Composers and Publishers Want Radio Users to Pay Fee

Representatives of the American Society of Composers, Authors and Publishers have been in conference with representatives of great broadcasting stations trying to adjust questions of alleged infringement of copyright in connection with radio. It was proposed that the government be requested to collect a license fee from every radio receiving set in the country to compensate music and song writers whose work is used by the broadcasting stations.

E. C. Mills, Chairman of the Executive Board of the Music Publishers' Association, urged that the 588 public broadcasting stations be reduced to 40 and that the selection of programs be controlled by officials representing the public in the vicinity of the station and by others representing the Department of Commerce.

A number of interesting points were taken up in conference between the copyright owners and the radio men. After a statement of the position of the song and music writers, A. H. Griswold, representing the American Telephone and Telegraph Company, asked:

"Is it your position that, having received a royalty on music that is recorded on a phonograph record or player roll, you would expect additional royalties if that roll or record is played again at a broadcasting station?"

"Absolutely," replied Mr. Mills. "I will explain that point. The royalty that we receive under the law from the manufacture of a phonograph record, for the right to mechanically reproduce a copyrighted musical composition, is in consideration of a right to manufacture, not a right to publicly perform; and the right to manufacture does not include the right to publicly perform."

William H. Easton, Vice President of the Westinghouse Electric & Mfg. Company, here interrupted:

"A radio is put in a restaurant. If it has been installed there and is used to play a broadcast program for the diners, is there liability for a third payment?"

"Certainly," replied Mr. Mills. "This would constitute a public performance for profit."

"It seems to me," said Mr. Easton, "that if you were paid once for public performance on that composition, that two payments should not be made for the same rights."

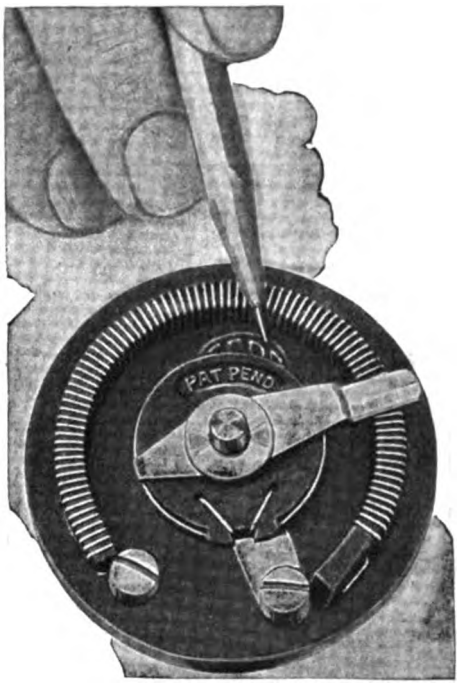
The song writers and composers are accused by the radio men of failing to make allowance for the value rendered by radio in introducing music to the public. The former deny the benefit.

Radio Compass Saves a Sinking Crew

Radio advices received last week by the Cosulich Line, at its New York City offices, stated that twenty-four members of the crew of the sinking Italian freighter "Giulia" had been rescued following three attempts on the part of life boats to reach the vessel. The message from Captain Ettore Zar of the "President Wilson," which made the rescue, stated that he had located the "Giulia" by means of the radio compass. The SOS call was picked up at a distance of 370 miles.

Radio Aids in Reporting Crop Damage

The Bureau of Agricultural Economics Department of Agriculture, has estimated the damage to the peach crop in Georgia, by the recent freeze at 37 per cent. The statistician of the service pays this official tribute to radio in his report: "This is the first crop report on record where material was secured by aid of radio. Acknowl-



Fada Rheostats and Potentiometers

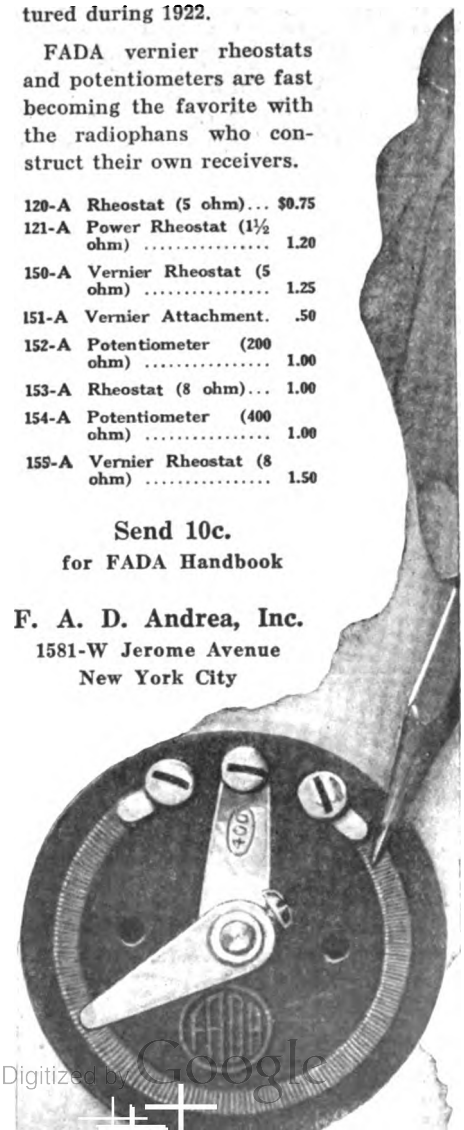
Over a million and a half FADA receiving tube rheostats alone were manufactured during 1922.

FADA vernier rheostats and potentiometers are fast becoming the favorite with the radiophans who construct their own receivers.

120-A	Rheostat (5 ohm)	$0.75
121-A	Power Rheostat (1½ ohm)	1.20
150-A	Vernier Rheostat (5 ohm)	1.25
151-A	Vernier Attachment.	.50
152-A	Potentiometer (200 ohm)	1.00
153-A	Rheostat (8 ohm)	1.00
154-A	Potentiometer (400 ohm)	1.00
155-A	Vernier Rheostat (8 ohm)	1.50

Send 10c.
for FADA Handbook

F. A. D. Andrea, Inc.
1581-W Jerome Avenue
New York City



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DX Nite Owls

(*Continued from page 21*)

Watch Your Heels, Mr. Anthony

From Hugh Taylor, 1434 Meridian Pl., N. W., Washington, D. C.

ON running across Mr. Robert Anthony's claim to the "Radio Golf" record in the Jan. 27th issue of the RADIO WORLD, I decided to send in my record. I have a single-circuit regenerative detector and two stages of audio-frequency. The following are the stations received on March 8, 9, and 10:

March 8, Three Hours' Play—WAC, Schenectady, N. Y., 400 miles; WOR, Newark, N. J., 218; WIP, Philadelphia, Pa., 136; WBZ, Springfield, Mass., 367; WEAF, New York, N. Y., 228; WJZ, Newark, N. J., 218; CFCF, Montreal, Canada, 669; WSB, Atlanta, Ga., 648; WCAD, Canton, N. Y., 200; WDAO, College Park, Ga., 700; WCAE, Pittsburgh, Pa., 302; KSD, St. Louis, Mo., 824; WHAS, Louisville, Ky., 663; KDKA, Pittsburgh, Pa., 302; WNAC, Boston, Mass., 463; WSV, Little Rock, Ark., 1,200 miles. Six local stations. Total, 7,544 miles.

March 9, Three Hours' 30 Minutes' Play—WOR, Newark, N. J., 218 miles; WUZ, Newark, N. J., 218; WEAF, New York, N. Y., 228; WGM, Atlanta, Ga., 648; WGY, Schenectady, N. Y., 400; WGI, Medford Hillside, 400; WBZ, Springfield, Mass., 367; WEAR, Baltimore, Md., 40; CKAC, Montreal, Canada, 669; CPCA, Toronto, Canada, 425; WHAS, Louisville, Ky., 663; WCAE, Pittsburgh, Pa., 302; KSD, St. Louis, Mo., 824; WMC, Memphis, Tenn, 898; KDKA, Pittsburgh, Pa., 302; WGV, New Orleans, La., 1,200. Nine local stations. Total, 7,892 miles.

March 10, Five Hours' 45 Minutes' Play—WJZ, Newark, N. J., 218 miles; WOR, Newark, N. J., 218; WGY, Schenectady, N. Y., 400; WEAF, New York, N. Y., 228; WOC, Davenport, Ia., 1,000; WHAS, Louisville, Ky., 663; WHAB, Galveston, Texas, 1,500; WDAY, Fargo, N. D., 1,525; WCAE, Pittsburgh, Pa., 302; CFCA, Toronto, Canada, 475; WMC, Memphis, Tenn., 989; WNAC, Boston, Mass., 463; WLAG, Minneapolis, Minn., 210; WMB, Auburn, Maine, 675; WLAK, Bellow Falls, Vt., 576; WJAZ, Chicago, Ill., 770; 8XN, Lewisburg, Pa., 225; KDKA, Pittsburgh, Pa., 302; WIP, Philadelphia, Pa., 236; WBZ, Springfield, Mass., 367; WHAM, Rochester, N. Y., 394; WSB, Atlanta, Ga., 648; CFCF, Montreal, Canada, 667; WDAF, Kansas City, Mo., 1,171; KFI, Los Angeles, Cal., 2,980; WGM, Atlanta, Ga., 648; WDAU, College Park, Ga., 700; WDAP, Chicago, Ill., 790; WFI, Philadelphia, Pa., 136; PWX, Havana, Cuba, 1,590; WLAM, Springfield, Ohio, 490; WKY, Oklahoma City, Okla., 1,416; WPAL, Columbus, Ohio, 487. Total, 18,408 miles.

Grand total, 40,628 miles in 12 hours, 15 minutes. Consider my distance and my time. The distance is further, the time shorter. I leave it for the Editor to decide. Mr. Robert Anthony's time was 14 hours and 20 minutes. Distance, 39,348 miles.

* * *

Not Pretentious, But Strictly DX

From F. R. Tilton, Jr., 287 New York Ave., Brooklyn, N. Y.

AM enclosing list of stations I have received with a single-tube regenerative set. The farthest I have received is Fort Worth, Texas, a distance of 1,850 miles:

WDAP, Chicago, Ill.; WBAP, Fort, Worth, Texas; WDAF, Kansas City, Mo.; KDKA, Pittsburgh, Pa.; WHAS, Louisville, Ky.; WAAZ, Emporia, Kan.; WHAZ, Troy, N. Y.; WNAC, Boston, Mass.; WEY, Wichita, Kan.; KSD, St. Louis, Mo.; KYW, Chicago, Ill.; PWX, Havana, Cuba; WOH, Indianapolis, Ind.; WOZ, Richmond, Ind.; WOC, Davenport, Ia.; WWJ, Detroit, Mich.; WWI, Dearborn, Mich.; WSB, Atlanta, Ga.; WBZ, Springfield, Mass.; WGY, Schenectady, N. Y.; WGI, Medford Hillside, Mass.; WFI, Philadelphia, Pa.; WOO, Philadelphia, Pa.; WIP, Philadelphia, Pa.

The majority of the above stations have been received after 10 o'clock at night. Not counting the local stations.

* * *

Another Single Circuit Record

From Marvin Shew, 64 Long Branch Ave., Long Branch, N. J.

AS a constant reader of RADIO WORLD I wish to state my interest in the department, "With the DX Nite Owls." My record is not very impressive, but might be of interest to other readers. The hook-up I am using consists of detector and one-step of audio-amplification. I have heard 35 stations during the two weeks that my set has been in use. Some of them are: CKAC, WOC, PWX, CHXC, CEAC, 2,000 miles; WWJ, WBAP, 1,400 miles; WPO, WSB, CFCA, WHAS, WDAP, KYW, KFL, 2,400 miles; WKAQ, 1,600 miles; WDAF, KDYS, 1,900; besides others. My hook-up is a single circuit with which I have heard 12 different states. The antenna I use is 50 feet long, consisting of one wire, 25 feet above the ground.

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Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.
THE POST SOLDERING IRON
Platinum Heating Unit—Interchangeable Tips—Universal Current
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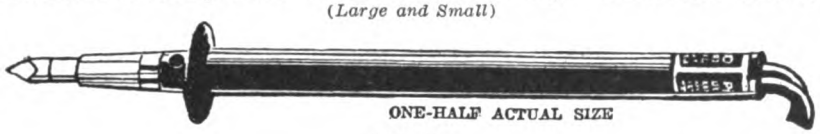
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RADIO BROADCASTING MAP
FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.
Everyone who wishes to get the maximum pleasure and enjoyment from Radio should have a Rand McNally Radio Map of United States. It is complete accurate and up-to-date.
The Rand McNally Radio Map of United States is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.
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1493 BROADWAY NEW YORK CITY

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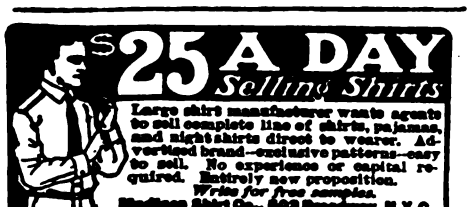
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FROM PUBLICATION OFFICE,
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M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
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Technical Editor Robert L. Dougherty

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Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.

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insure quality in pliers. They give good service, and cost no more than inferior tools.

"Red Devil" Slip Joint Plier No. 924—6½-in., shown above, combines a shear cutter, burner grip and screw driver. Price 50c at dealers or us.

SMITH & HEMENWAY CO., Inc.
Manufacturers of "Red Devil" Tools
273 Broadway New York, N. Y.

FOOTE'S HAND-MADE TRIPLE-TEST CRYSTAL

"Puts Its Best Foot Foremost"

Its supersensitive side is up and has loudly received broadcasting. Guaranteed QSA (your signals are strong). Look for the "T" on the back.

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Wanted. Liberal Commissions. Large sales. Quantity Production. Wire Territory desired.

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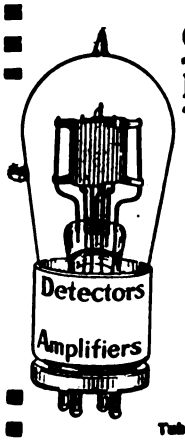
107 N. 10th St. Philadelphia, Pa.
Established 1876



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Broken and Burned-Out

VACUUM TUBES

W.D.-11 not accepted for repair

Your dealer should know, but if he does not, send direct to

HARVARD RADIO LABORATORIES
Boston 9, Mass.
Tubes returned Parcel Post C. O. D.

NU-TYPE ANTENNA

50% more volume, 35% Less Voltage on Element of tubes, which means fewer burnt out tubes and battery recharges.

CAN BE BUILT FOR $2.50

Complete instructions and diagram, $1.00

E. A. Sampardi Brazil, Indiana.

Radio Apparatus at Real Prices

22½-V. Var. "B" Battery, guar....89c

Clapp-Eastham Rheostat, air cooled 39c

Vernier Condenser, .0005 with bakelite ends and dial.....$3.69

Honeycomb Coils, 25, 35 or 50 turns 39c

.006 Condenser, hermetically sealed, Westinghouse 59c

Mahogany Cabinet, with panel 7"x9", hinged top, Genuine Clapp-Eastham $2.19

Grebe Type 3-in. Dial, brass bushing 34c

Double Coil Mount, adjustable, pig-tail leads $2.89

Triple Coil Mount, adjustable, pig-tail leads $3.69

Variocoupler $1.99
16 Six-inch Soldered Leads.

Send 5 cents for Catalogue.

It will pay you to get on our mailing list. We pay the postage.

No orders for less than $2.00 accepted.

Send no stamps or checks.

THE RADIO SHACK

New York's Leading Retailer

338 WEST 42nd STREET

Dept. No. 47 NEW YORK, N. Y.

Wants Phonograph Music Eliminated from All Stations

EDITOR, RADIO WORLD: I have observed a communication from one of your radio fans questioning whether WHN should broadcast after 10:30 p. m. I very seldom receive concerts from this station, but when I do receive I have found the music acceptable. I believe that the great majority of listeners-in prefer this nearby music to that of distant stations, the reception of which is uncertain.

There is no doubt there are a great number of radio fans who have the distance itch—myself included—but we must realize that where there is a station broadcasting acceptable material it is giving amusement to the great majority of listeners. But when we have a station which makes a habit of passing out only phonograph music I think that station should be silenced. I make particular reference to the Paterson station, WBAN. It is common practice among a large number of fans in Paterson to shut off their receiving sets while WBAN is operating. Their modulation is exceedingly poor; and this adds insult to injury, especially after having listened to a first-class concert from WJZ, and then WBAN comes in with its noise and phonograph music. If the station would put out acceptable music, or lectures, or anything of an educational nature, I am sure listening in to distance stations would come second.

There is another small station which broadcasts entertaining material, and that is WRW, of Tarrytown, N. Y. When this station is operating it is generally at a late hour, but it does not interfere with distance work if the fan is so inclined.

There is only one other station I know of that is as bad as WBAN regarding the quality of its broadcasting material, but I have so far been unable to get its call.

I think it would be well for RADIO WORLD to carry on propaganda to have continuous performance of phonograph music eliminated from all stations.

Yours very truly,
10 Rodney St., ARTHUR C. MASON.
Glen Rock, N. J.

WILLARD

4/7/23

WILLARD RADIO CO.

Dept. R. W., 291 Broadway, New York

REINARTZ CIRCUIT
EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD variable condenser, 1 13-plate .00025 MFD variable condenser, 3 inductance switches, 16 switch points and nuts, 4 switch stops and nuts, 2-3" dials, 8 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, necessary bus bar wire, 1 high grade Radion panel and diagram and complete instructions.....$10.00

FLEWELLING CIRCUIT
EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak, 1 23-plate .0005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit $11.00

CONDENSERS

3 Plate Variable; value, $1.75	$1.65
13 Plate Variable; value, $2.50	1.20
23 Plate Variable; value, $3.50	1.35
43 Plate Variable; value $4.50	1.85
13 Plate VERNIER; value, $5.50	$3.75
23 Plate VERNIER; value, $6.00	4.00
43 Plate VERNIER; value, $6.50	4.25
Reinartz Coils; value, $2.50	1.75
V. T. SOCKETS—Nickeled brass sleeve, composition base; value, $1.00; special at	.50
Ball Bearing inductance switch; value, 75c; special at	.30
Honeycomb Coils, 50 turns, mounted	.95
Honeycomb Coils, 75 turns, mounted	1.00
Double Coil Mountings	2.45
Triple Coil Mountings	3.35
Audio-Freq. Transformers	2.75
FILAMENT RHEOSTAT — Condensite base; value, $1.10; special at	.70
FILAMENT RHEOSTAT with 2⅛" dial; value, $1.50; special at	85c
Potentiometer with knob; value $1.75; special at	1.00
Potentiometer with 2⅛" dial; value, $2.15; special at	1.15
BEST QUALITY JACKS, Single circuit; value, 65c; special at	.30
Double circuit; value, 90c; special at	.45
VARIOCOUPLER — Celeron condensite and Litz Wire wound secondary; value $4.50; special	3.25
THREE-INCH DIALS—Unbreakable—heat resisting composition—high finish; special	.30
TWO-INCH DIALS—Same design—for rheostats and potentiometer; special	.25
EXTRA SPECIAL — Telephone 3000 Ohms Headsets; $9.00 value; reduced to	3.50
RAYMOND VERNIER RHEOSTATS—Value, $1.50; special	.95
Aluminum Loud Speaking Horn—Nickel Plated; list $8.00	3.75

Write for our Catalog No. 7
Illustrating and describing all our products.

Every article advertised above is guaranteed both by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID on all orders of $5.00 or over east of the Mississippi River. All others include postage.

SUNBEAM

SUNBEAM MOTTO

FIRST FOR PRICE, QUALITY, AND SERVICE

11 years at the same spot

All standard merchandise guaranteed.
Prices going up. Take advantage of present low rate.

Our guarantee provides you satisfaction, or your money back, we will refund transportation charges if not satisfied.

Sunbeam Detector $45.00
Sunbeam 1 Step Amplifier..... 75.00
Sunbeam 2 Step Amplifier..... 125.00

(Complete with Tubes, "B" Battery, "A" Battery, Phones, Aerial, etc.)

We will send any set for your approval, you may try it under any and all conditions for ten days, if you are not absolutely satisfied send us the set, and we will return your money.

This is one of the numerous testimonials to the service which we render.

12 Wave Ave., Wakefield, Mass.,
Feb. 12, 1923.

Sunbeam Electric Co., New York City:—
Gentlemen:—Permit me to express my appreciation in the way my recent order was handled for a set of Berwick phones and Dictograph Speaker, both of which were highly satisfactory. . . . Again thanking you for the very prompt attention given my order and for the high grade material supplied, I am
Very truly,
(Signed) EDW. L. NUTE.

Sunbeam Long Wave Variocoupler, 150 to 3000 Meters, Complete with Solid Bakelite Variometer Mounted $11.95

Coil Only 3 Layer, Bank Wound, Silk Wire (Hook-up Furnished with Coil) $3.25

Select your set and write us for prices. We'll do the rest.

SUNBEAM ELECTRIC COMPANY

71 THIRD AVE. (Bet. 11th and 12th Sts.), NEW YORK

Farm Lighting Plants at Bargain Prices.

The dials with absorption losses reduced to a Minimum

Specially designed cross-section insures minimum loss. Enamel, graduation and numbers are particularly clear. Knob so shaped that fingers do not interfere with easy, accurate reading.

Na-ald dials are moulded from genuine Na-ald material. Rheostat heat will not affect them. They run true; cannot warp.

3-INCH DIAL 35c
2-inch dial for rheostat potentiometer use, 50c; 3⅛" dial, 75c.

Send stamp for literature.

Alden Manufacturing Co.
Formerly Alden-Napier Company
52 Willow St., Springfield, Mass.
Dept. L.

NA-ALD

WANTED! Old copies of RADIO WORLD for new copies. The publishers are short of the following numbers: April 22, May 20, June 24, October 21, December 2. Mail us these copies and we will send you a copy of a current issue, or extend your subscription one issue. RADIO WORLD, 1493 Broadway, New York.

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Subscribe for RADIO WORLD. $6.00 a year, $3.00 six months, $1.50 three months.

Court Asked, "Who Owns the Ether?"

THE first court fight over the freedom of the air in radio will take place at the Livingston County Court House at Pontiac, Ill., at the April term. Edward McWilliams, wealthy President of the State Bank of Dwight, last November was granted a temporary injunction restraining G. Wylie Berman, eighteen, an amateur wireless operator at Dwight, from using his broadcasting station because it is alleged to have interfered with the receiving of radio telephone returns in the McWilliams home on election night. Herbert Hoover, Secretary of Commerce; Mitchell Lewis, machine gun manufacturer of New York, and Hiram Percy Maxim, President of the American Radio Relay League, are expected to attend the hearing.

Staten Island Man Denies He "Jazzed" Paris by Radio

THEY are having a hot discussion in Paris as to whether amateurs there actually received last week a wireless message from a Mr. Webb of Tottenville, Staten Island, as has been asserted. W. S. Webb of Tottenville has denied that he was the author of the radio "jazz" that interrupted the concerts of Paris. He said he had a radio equipment, but that it was not suitable for sending messages. Elmore Ragues, another resident of Tottenville, has the only set there powerful enough to send music to Paris. But Mr. Ragues denied that he had forwarded any "jazz." He said that he had no license to send out music, his sending activity being limited to code.

The French authorities are still searching for the "wild cat" station.

RADIO SPECIALS

52-Page Catalogue and Code Card Free with Every Order

CLAPP-EASTHAM RECEIVERS

Type HR Regenerative Receiver—Mahogany Cabinets..... $25.00
Type HZ Two-Stage Amplifier—Mahogany Cabinets..... 25.00
The Sets You See Advertised for $40.00

Nathaniel Baldwin "C" Headsets	$12.00
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Frost 2000 ohm double Headsets	5.00
Frost 3000 ohm double Headsets	6.00
Murdock 2000 ohm double Headsets	5.00
Murdock 3000 ohm double Headsets	5.50
Murdock 80 ohm Receivers	1.50
Double Headbands, fits all phones	.75
Single Headbands, fits all phones	.50
Double Phone Cords—six feet	.50
Single Phone Cords—six feet	.35
G. A. Phone Condensers, .001 mfd.	.20
G. A. Grid Condensers, .0005 mfd.	.20
Moulded Phone Condensers, .001 mfd.	.50
Fesco 3 plate Variable Condensers	1.50
Fesco 11 Plate Variable Condensers	2.25
Westwyre 3 Plate Variable Condensers	2.25
Westwyre 11 Plate Variable Condensers	3.30
Westwyre 23 Plate Variable Condensers	3.80
Westwyre 43 Plate Variable Condensers	4.75
Westwyre 11 Plate Var. Vernier Cond.	5.25
Westwyre 23 Plate Var. Vernier Cond.	5.75
Westwyre 43 Plate Var. Vernier Cond.	6.75
Dials furnished with all Var. Cond.	No charge
Na-Ald Condensite 3-inch Dials	.35
Whitall Moulded 3½-inch Dials	.50
Whitall Red Condensite Sockets	.50
Radio Corp. Pere. Sockets for 5-w. tubes	1.00
Na-Ald Condensite Sockets for W D-11	.75
Whitall Moulded Rotors, 3 11-16 diam.	.50
Federal 2-circuit Jacks	.00
Frost Plugs, will take cord tips	$0.65
Eveready "B" Batteries, 22½ V, small	1.75
Eveready "B" Batteries, 22½ V, large	3.00
Eveready "B" Batteries, 45 V, regular	5.50
Seneca "B" Batteries, 22 V, storage	11.50
Red Seal Dry Cells, 1½ V, for W D-11	.40
Red Seal Sparkers, for W D-11 tubes	1.00
Acme Amplifying Transformers	4.50
Radio Corp. U. V. 712 Amp. Transformers	7.00
Radio Corp. U. V. 714 Radio Freq. Trans.	6.50
Thordarson Amplifying Transformers	4.00
Bradleystats—The perfect Rheo	1.85
Paragon Rheostat	1.50
Radio Corp. Rheostat PR 836	6.00
King Rheostat—A perfect Rheo	1.00
King Vernier Rheostat	1.50
Whitall 600 Meter Variocouplers	2.75
Paragon Crystal Detectors with galena	1.00
Whitall double tested galena, mounted	.25
Whitall double tested galena, unmtd.	.25
Woodemetal for mounting crystals	.10
Switch Points, ¼x⅛-inch, per dozen	.10
Switch Stops, per pair	.05
Whitall Switchlever, 1½-inch radius	.30
Copper Soldering Lugs, per doz.	.10
Yellow Spaghetti for No. 14 wire—3 ft.	.15
Black Spaghetti for No. 14 wire—3 ft.	.15
Watch Case Voltmeters for "B" Batteries	2.25
Bristol Audiophone	40.00
Westinghouse Vocarola	20.00

Square Buss Bar Wire, No. 14 Square and Tinned, 2 ft. lengths..... $0.05
Diste Coils, the Perfect Reinartz Wound Coil, Special..... 1.75

Complete Stock of Atwater Kent Radio Apparatus—Complete Stock of Dubilier Condensers
Mail Orders filled same day as received.

THE WHITALL RADIO CO., SPRINGFIELD, MASS.

PARTS PRICES SLAUGHTERED

CASH WITH ORDER
PARCEL POST PREPAID

$6.50 Guar. 1½ Volt Tubes (detector and amplifier) for dry cells	$4.99
5.00 Detector Tubes, guar.	2.75
6.00 Amplifier Tubes	3.50
1.75 3 Plate Variable Condenser	1.25
3.75 23 Plate Variable Condenser	1.49
4.75 43 Plate Variable Condenser	2.75
1.00 Rheostat	.39
1.50 Kloosner Vernier Rheostat	1.19
5.50 W. D. 11 Transformer and for all dry cell tubes	4.50
$4.75 Phones, 2200 ohms, splendid receivers	$3.75
1.00 3-in. Hard Rubber Dial	.35
.90 V. T. Sockets	.69
1.50 22½ V. Cyclone B. Batteries	.89
1.75 22½ V. Cyclone B. Batteries	1.25
12.00 King Amplitone Loud Speaker Horns	5.75
Dictograph Loud Speaker	15.75
3.75 Vario Couplers	1.75
7.00 All Wave Coupler, 3000 Meters	6.95
5.00 Variometers	2.75

To avoid delays check items and total amount.

B. B. RADIO COMPANY

2202 MERMAID AVENUE Dept. W. BROOKLYN, N. Y.

All Deliveries Made Within Two Days

Use an ELECTRAD DIODE TUBE and get real results. Tube and socket, Special Price..... $2.50

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$8.00 Brandes Superior Phones	$5.95
$8.00 Federal Phones	5.25
$5.50 Murdock Phones, 3000 Ohms	4.35
$5.50 Rico Phones, 3000 Ohms	4.35
$12.00 Baldwin Phones	8.95
$6.00 Single Baldwin	4.50
Acme Transformer	$3.95
Bakelite Sockets	.59
Cortlandt Special Sockets	.39
Rheostat Special	.49

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$6.50 DeForest Detector and Amplifier	$5.95
$6.50 U. V. 201	5.95
$6.50 Cunningham 301	5.75
1½-Volt Tube, guaranteed	4.75
$5.00 Fischer Variometer	$2.10
$5.00 Fischer Variocoupler	2.10
23 Plate Variable Condenser	1.65
43 Plate Variable Condenser	2.35
W.D. 11 Transformer	3.45

Cortlandt Radio Co., 80 Cortlandt Street, New York City

Mail Orders Promptly Filled—Include Postage and Money Order

Which are you?

A small timer or do you bat in the Big League?

Do you like to reach over states and pull in the breezy line from the far West or hot stuff from down in Texas, or maybe the business twang of the good old East? Now that you've answered this questionnaire, remember that if you want Distance you want instruments built for Distance.

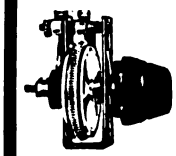
A Word to the Wise: Buy DX Instruments from D-X-Radio

Audio Frequency Transformers

Thordarson, $2.95 WD-12, $3.25
Acme, $4.00

Genuine "Bull Dog Grip" Plug, 90c

RHEOSTATS



Genuine Cutler Hammer Product. Necessary for fine adjustment. Reg. Price, $1.50. Our Price $1.25

Cutler Hammer Plain, regularly sold at $1.00. Our Price ..... 80c.
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Write out your choice and pin a Post Office Money Order to it. Mail at once to our Mail Order Department. Checks or stamps not accepted. Merchandise shipped postpaid East of the Mississippi.

For Free Catalogue Write Dept. 84D

D-X-Radio Co.

123 Liberty St. New York City

NATIONAL RADIO SERVICE CO.

140 W. 32nd St. New York, N. Y.

WALCON RADIO FREQUENCY TRANSFORMERS

Brings in DX Stations on a Loop. If you want Distance you Must use WALCON.

"The Transformer in the Shielded Brass Case"
List $4.00 **$3.65** OUR PRICE
Hook-Up for a New One-Tube Reflex Free
Merchandise Guaranteed. We Pay the Postage

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By Victor W. Page, M. S. A. E.

Uniform Size— 24 in. x 38 in.—Price 35c. Each.

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In this chart all parts of a typical double ignition system using battery and magneto current are shown, and suggestions are given for readily finding ignition troubles and eliminating them when found. Includes latest Delco, Connecticut and other systems. (24 x 38.) Price, 35 cents

Lubrication of the Motor Car Chassis.
This chart presents the plan view of a typical six-cylinder chassis of standard design and outlines all important bearing points requiring lubrication, and is a valuable guide to the correct lubrication of any modern car. A practical chart for all interested in motor car maintenance. (24 x 38.) Price, 35 cents

While each of the above three charts is complete, the set covers all maintenance instructions for the entire automobile.

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The most complete chart yet devised, showing all parts of the modern automobile starting, lighting and ignition systems, giving instructions for systematic location of all faults in wiring, lamps, motor or generator, switches and all other units. Invaluable to motorists, chauffeurs and repairmen. Size 24 x 38 inches. Price, 35 cents

Location of Ford Engine Troubles Made Easy.
An enlarged and revised chart showing clear sectional views depicting all portions of the Ford power plant and auxiliary groups. It outlines clearly all parts of the engine, fuel supply systems, ignition group and cooling system, that are apt to give trouble, detailing all derangements that are liable to make an engine lose power, start hard, or work irregularly. This chart simplifies location of all engine faults, and includes instructions for locating Ford electric starter troubles. Size 25 x 38 inches. Price, 35 cents

Location of Motorcycle Troubles Made Easy.
Price, 35 cents

The Six Charts Sent for $2.00

THE COLUMBIA PRINT
1493 Broadway, New York City

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Super Radio Frequency Amplification
Use the Super Radio Frequency Transformer and the Super Tuner and get real results. Eighteen months' exhaustive experimenting before placing on the market insures you the very best and most efficient R. F. Transformer. Designed on an entirely new principle and positively guaranteed. Write at once for our new trial proposition and other information. We have a new Super R. F. Circuit. It's free.
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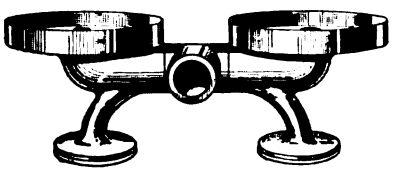
727 BATES STREET, DETROIT, MICH.

USE YOUR PHONOGRAPH



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USE YOUR PHONOGRAPH

We Recommend For Investment

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Complete details sent free upon request

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Specialists in Wireless Securities Since 1917
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YOU DX HAMS!
Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20?
This hook-up actually goes out and drags the distance in, and lays it at your table.
All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?
If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

Department of Agriculture Wants a Radio News Editor

THE United States Civil Service Commission announces the following open competitive examination:

The receipt of applications will close May 8. The examination is to fill a vacancy in the office of the Secretary of Agriculture, Washington, D. C., at entrance salaries from $1,800 to $2,100 a year, plus the increase of $20 a month granted by Congress, and vacancies in positions requiring similar qualifications.

The duties of radio news editor require suitable experience in either the agricultural or daily newspaper field. It is necessary that appointees be able to comprehend agricultural and scientific work being conducted by the Department of Agriculture, and to put such matter into popular form so that it easily may be sent out over the radio and understood by the layman.

Competitors will not be required to report for examination at any place but will be rated on a practical test, education and experience, and published newspaper articles prepared by the applicant, to be filed with the application.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil service examiners at the post office or custom house in any city.

Brothers United by Radio After 42 Years

THE Schenectady radio broadcasting station of the General Electric Company—WGY—was the means of reuniting brothers who had been separated for 42 years. Recently David Hill Voorhees, who lives near Schenectady, N. Y., sought the aid of Chief of Police James W. Rynex, of Schenectady, in locating his brother and sister, from whom he became separated 42 years before, when their parents died and the children were adopted by three different families. At the request of Chief Rynex WGY broadcast a message from Mr. Voorhees, who asked that his brother and sister get in communication with him. The message was put into the air, and the following Sunday Mr. Voorhees had dinner with his brother, Howard Hill, a sign painter, in Gloversville, N. Y. No word has yet been received from the sister.

Western Electric Sets Sales Record

THE Western Electric Company, Inc., which is controlled by the American Telephone & Telegraph Company, reports for the year ended December 31, 1922, a surplus, after all charges, including interest and dividends, of $1,144,936 against $823,997 in 1921. Gross sales were the highest in the company's history, topping the previous high record of 1920 by nearly $5,000,000 and exceeding the 1921 mark by approximately $21,000,000. The gross sales for 1922 were $210,941,004.

1000 Miles for $15
Complete set of parts for this wonderful set consists of 7x12 panel, 180° Bakelite coupler, 43 plate condenser, moulded ends, 8 Read 'Em Binding Posts, Framingham rheostat, socket, grid leak condenser, 2 dials, 2 switches, points, stops, bus wire, spaghetti and diagram. Better apparatus not obtainable at any price.

Parts for two-step Amplifier	$15.00
$3.50 Reinartz Coils	2.50
$5.00 Jefferson Transformers	3.95
$16.00 Baldwin Type "C" Phones	9.85

Send only post office money order or cash.
H. A. KINDERVATTER
16 South F St. Irvington, New York

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2,000-Mile, Single Tube Set, $24.39
Completely Assembled in Im. Mahogany Cabinet. Parts Mounted on Ebonite Panel.
We send full Aerial Equipment and Ducon Antenna Electric Light Plug, "B" Battery and Double Phone Head Set. All ready to "listen in" with the addition of U. V. or W. D. Tube and "A" Battery.
The Secret Hook-up of this Set gets D-X, Single Control.
We guarantee this Set and ship to you prepaid for $24.39.
THE VICTOR-KING CO.
36 BROMFIELD ST. BOSTON-S-MASS.

TUBES REPAIRED
WD-11
$3.50 AND POSTAGE
and other Vacuum Tubes, such as U. V. 200, U. V. 201, U. V. 201A Repaired and Guaranteed.
(No V. T. 1 or V. T. 2)
Mail Orders Solicited and Promptly Attended To.
H. & H. RADIO CO.
512 Clinton Ave. Newark, N. J.

FREE VOLTMETER or AMMETER With Every $5.00 Purchase
NEW YORK PRICES DIRECT TO YOU
A Money-Back Guarantee Goes With Everything We Sell
WE SELL ONLY STANDARD PARTS AT LOWEST PRICES

Kloesner Vernier Rheostat	$0.70
Atwater-Kent Variometers	6.75
Atwater-Kent Variocouplers	6.75
Raven Molded Variometer	4.00
Westinghouse Dry Cell Tube	5.50
French Detector Tubes	4.00
French Amplifying Tubes	4.50
U. V. 200 Tubes	4.00
U. V. 201 Tubes	5.75
A. & P. Detector Tubes	3.75
Cunningham 301 Tubes	5.75
A. B. C. 23 Pl. Condenser	1.90
A. B. C. 43 Pl. Condenser	2.30
A. B. C. 23 Pl. Vernier Condenser	3.75
A. B. C. 43 Pl. Vernier Condenser	4.00
Acme Audio Transformer	4.00
Original Baldwin Type C Phones (double)	8.75
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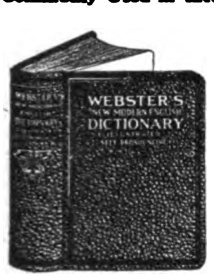

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ECLIPSED only in importance by her powerful machinery and delicate controls the radio installation aboard the "Leviathan," which re-enters the trans-Atlantic service some time in June flying the U. S. Lines flag, will be the most powerful and elaborate steamship radio equipment in the world. The contract to equip the "Leviathan" with a super-power marine radio installation has just been signed with the U. S. Shipping Board by the Radio Corporation of America and work in connection therewith is now in progress. The completion of this work will give to America the distinction of radio supremacy upon the seas.

Once a transporter of American doughboys and now a palatial hotel, the "Leviathan's" radio equipment will enable her pasengers to exchange messages with two continents regardless of her position on the high seas. With equipment six times as powerful as that carried by the average ocean greyhound, uninterrupted communication with points 3000 miles distant is assured. Upon leaving her berth in New York Harbor, the "Leviathan's" radio officers will be able to link the huge vessel with various marine centers in Europe and to communicate with America when leaving European ports.

In addition to telegraph service, a radio telephone installation which will provide voice contact with other vessels and shore stations is also to be installed. While it is not expected that a commercial telephone service will be inaugurated immediately upon the "Leviathan" going into commission it is quite probable that shore stations will in the no distant future be erected to handle wireless telephone traffic from ships in mid-ocean to points inland over the conventional land line system. When such arrangements have been made passengers and officers on vessels at sea may establish contact with those on shore at their homes or offices and speak with them with the same facility and ease that accompanies an ordinary telephone conversation.

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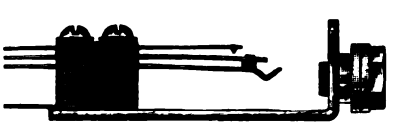

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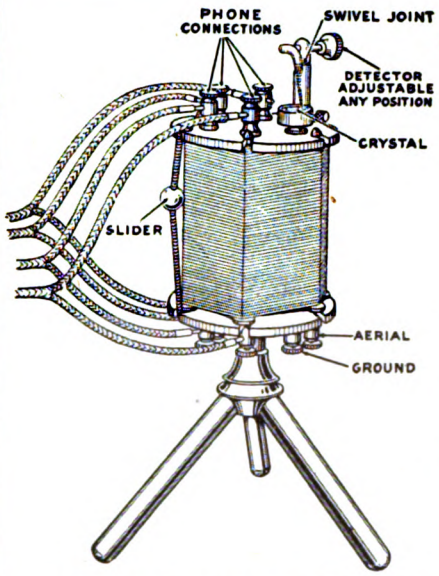

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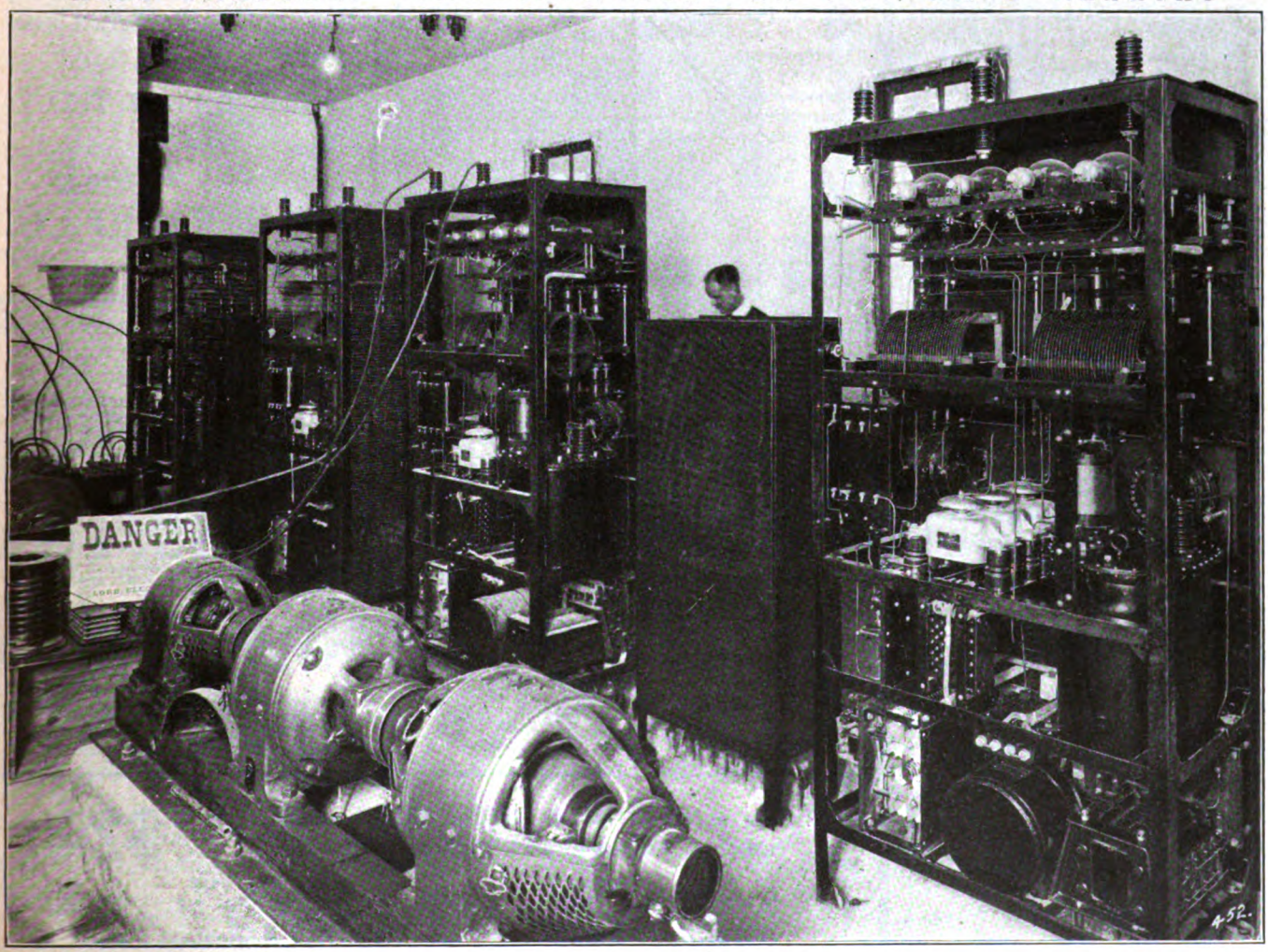

(C. Radio Corporation of America)

The first interior view of the new broadcast station now in process of construction by the Radio Corporation of America atop Aeolian Hall, New York City. This station probably will be in operation early in June and will make possible simultaneous transmission on two wave lengths. The station is owned and will be operated by the Radio Corporation of America. It is the last word in broadcasting development and equipment.

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De Forest Radio Control Sold to Detroit Auto Interests

President Charles Gilbert, of the De Forest Radio Telephone & Telegraph Co., Jersey City, N. J., announced on April 6 that a controlling interest in the company had been sold to a group including Edward T. Jewett of the Paige Motor Car Company, Frank W. Blair, President of the Union Trust Company of Detroit; A. C. Allyn, president, and Theodore Luce, vice-president, of A. C. Allyn & Co., bankers, of Chicago and New York, and William H. Priess, inventor of the Priess circuit used in the De Forest reflex set. In a statement Mr. Gilbert said:

"Certain automobile interests who realize the rapid growth and the strong position of the De Forest company through the ownership of the De Forest audion patents, recently became interested in radio as an attractive field for future development, and opened negotiations for the purchase of this controlling interest. As a result there will be a material increase in the cash capital and the resources of the De Forest company, which will enable it greatly to extend its present field of operation. The new company will retain the services of Dr. Lee De Forest for a period of ten years as consulting engineer, with the rights to his radio inventions during that period. The De Forest audion and other basic patents owned by the De Forest company are used by the American Telephone and Telegraph Company, the Radio Corporation, the General Electric Company and the Westinghouse Company. De Forest patents have been used in transcontinental telephony and transoceanic radio."

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President Obregon of Mexico listened in for the first time to a radio concert in Spanish broadcast from Station KSD of the St. Louis "Post Dispatch," in St. Louis, Mo. The President and the "Lady of the Land" were delighted with the results. So much so that they decided to equip Mexican White House with two R. C. Type Westinghouse receivers of American make.

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

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Vol. III, No. 3. Whole No. 55 April 14, 1923 15c. per copy, $6.00 a year

Neat and Efficient Amateur C W Station

By Ray Bright

(C. Photonews, N. Y.) R. L. Koerner's long distance station 2CRQ, New York City

THOSE of you who listen in for DX CW will recognize the call of 2 CRQ, the station of R. L. Koerner, New York City. That is, of course, if you live within 1,500 miles of New York and own anything outside of a crystal set. Well, now that you have heard about the record of this 10-watt station, you are privileged to take a peek at it as well as the owner of the station.

Of course, the most interesting part of the station is the transmitter, which is located directly over the Reinartz receiver on the left of the picture. It is a two tube outfit, with an output of 10 watts. Two 20-watt kenotron rectifiers are used to supply the plate voltage. The Heising system of modulation is employed and the transmitter can be used either for phone, when one tube is used as an oscillator and one as a modulator, or for CW when both tubes are used as oscillators. With special reference to the transmitter, it will be seen that there are three meters used. The one on the extreme left is a milliameter, used in the plate circuit. On the right is a voltmeter to check up on the filament current, while above the transmitter is the thermo-couple radiation meter to allow a check on the current being radiated. As seen in the illustration there are two receiving sets used in the station. The one directly under the transmitter is the well known and widely used Reinartz circuit. By close reference to the picture it can be seen that it is connected to an outside amplifier from which the loud speaker is supplied. The other is a long wave receiver, with two stages of amplification.

It is interesting to note the remarkable strides that have been taken in the design and operation of amateur stations in the past few years. It used to be that in order to even have your station noticed you had to have rotary gaps and OT's sprawled all around the room, threatening to electrocute anybody who didn't sit right in the plum center of his chair. Now, with apparatus such as shown, 1,500 to 3,000 miles is an everyday occurrence. Such a thing as being heard in France and England has lost even its original thrill, and is looked upon as ordinary procedure.

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"Build Me!" Cries This New Two-Unit Receiver

By Arthur S. Gordon

A RADIO receiving set which will challenge the interest of all radio amateurs is the one-step amplifier described in the present article. It is so clearly designed that the veriest novice need not hesitate to build it according to plans. The set is extremely handsome, its initial cost is moderate and its upkeep, because of the dry cell tubes used, is negligible.

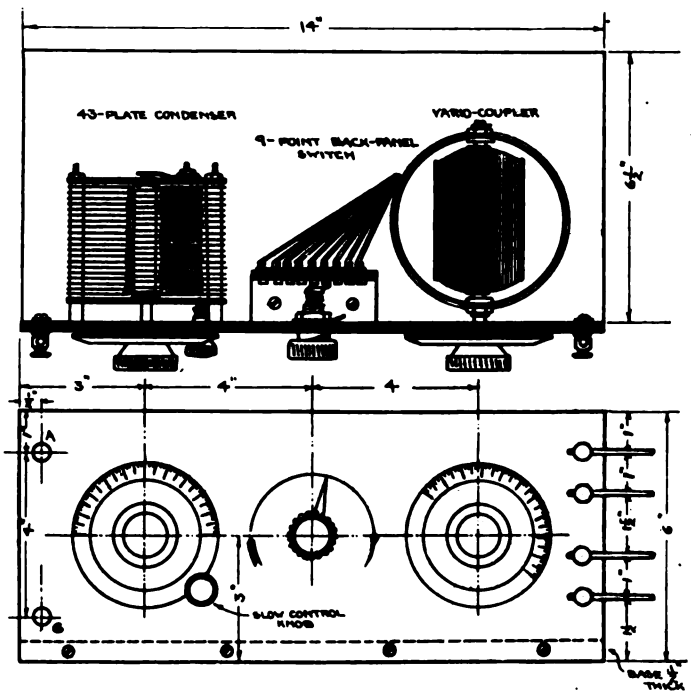

Fig. 1. First section of the two-unit set. This is only the tuning apparatus. The detector and amplification panel are separate.

The coils include all the new broadcasting wave lengths from 200 to 600 meters, with enough inductance to spare for a slight emergency. The receiver is made in two somewhat unusual units which are joined together by four connecting wires to make the arrangement complete. The first unit is called the tuning unit. It consists of a variable condenser, a variocoupler, and a back-panel switch for varying the number of turns on the primary on the variocoupler. The second unit—the electron unit—consists of the tubes, rheostats, telephone jacks, the grid-leak condenser and the audio-frequency transformer.

This is not the usual arrangement, but it has the charm of being distinctive as well as entirely logical. Briefly its advantages are these: The electron unit is perhaps the one that will remain the same as long as the amateur uses dry cell tubes. It is, in a sense, a detached portion of the receiver, having a form of permanency that the other portion does not have. For styles and ideas in tuning devices often change, and it is altogether possible that the amateur may later wish to install another standard type of coupler. It may even be the case that a tuning device of his own design needs trying out. All this will necessitate an almost complete re-building of the tuning unit. In such a case, the electron unit may be disconnected and removed from the scene of replacement, ready at any moment to be reconnected to any combination of tuning devices the amateur decides to install.

The hook-up used is the justly famous single circuit Armstrong regenerative, using the rotor, or movable coil of the variocoupler, as a feed-back inductance. This circuit has been proved and tried in a thousand different ways. It is the basic circuit from which amateurs begin a fascinating career of experimentation. The popularity of this circuit is an adage, and this, combined with its truly remarkable results, make it ideal for the radio beginner. Be neither timid nor alarmed because of the extra tube. One stage of amplification is not only desirable, but inevitable; and this article will explain fully the necessary steps for its complete installation.

The Tuning Unit

The first section of this receiver is called the tuning unit because in it are included only those instruments necessary for bringing in or tuning out a station. It consists of three instruments. They are mounted on a panel from left to right in the order named: Variable condenser, inductance switch and variocoupler. Fig. 1 shows the exceptionally neat arrangement with all the elements drawn to scale. The variable condenser is any standard 43 plate condenser, with or without a vernier attachment. A vernier is an extra device which permits of very fine adjustment and should the prospective builder buy, or already have, a condenser that is not fitted with such a device, it is recommended that a minute control knob be fitted to the dial of the condenser, in order that very slight variations may be secured. Such a knob is shown in place in Fig. 1. It may be bought very cheaply at any radio store.

The inductance switch is a back-panel device with nine switchpoints, each going to a tap in the primary winding of the variocoupler. These switchpoints are mounted in the usual semi-circle on a separate piece of bakelite, which stands 5 inches high and 3 inches in a vertical position one inch to the rear of the panel.

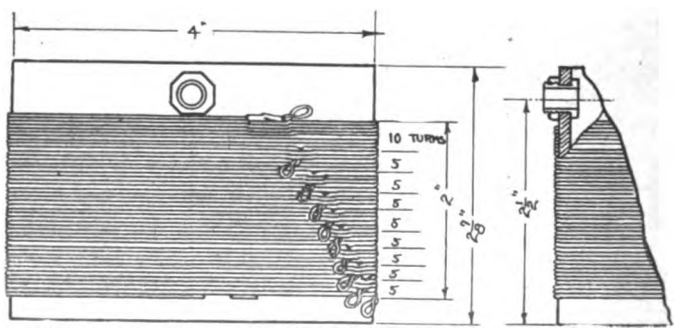

Fig. 2. Detailed sketch of the primary of the coupler, showing the manner in which taps are to be taken. If a fibre tube is used to wind the coil, the brass bushing will be unnecessary.

They are connected with the taps on the coils by straight pieces of bare copper wire or bus bar. The switch is controlled from the face of the panel by a standard switch knob, which is changed over a trifle so that its arm is in the rear instead of in the front of the panel.

The variocoupler is of a favorite type and is selected for use in this set because of its extreme ease of construction. There are other more intricate ways of making variocouplers, and there are other forms of

(Continued on next page)

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tuning devices; in fact, so many that the prospective builder is bewildered as to which is the best. Nothing is claimed for this particular tuner that is not claimed for others, excepting that it has been designed to receive on the increased number of wave lengths now released for broadcasting work. The number of turns have been closely figured out so that there is a minimum of dead end effect, which is a detrimental element caused by the proximity of the unused portion of the coil to that portion which is at that moment in tune with the incoming signals. It is extremely selective, as many as six different stations being received with

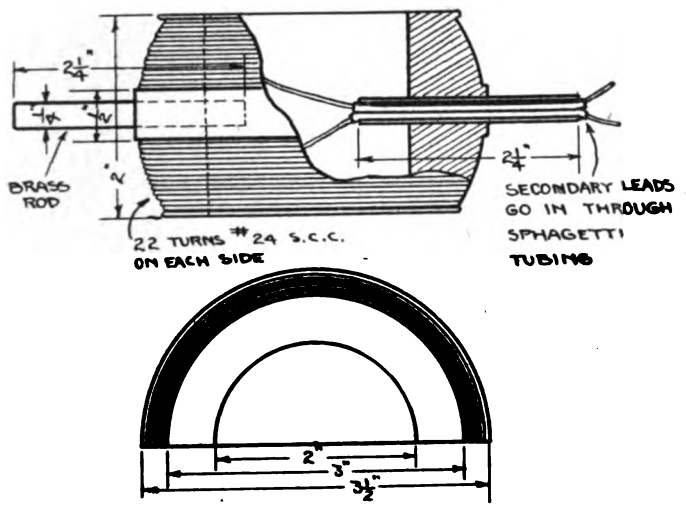

Fig. 3. The rotor of the coupler. The leads are brought out through the hollow tubing, eliminating copper-braided "pigtail" connectors.

one-half turn of the rotor, the condenser remaining untouched at the time.

The two coils of the coupler are the primary and the secondary, the last mentioned being in this case the tickler coil as well. The primary is wound on a 4-inch cardboard or bakelite tube with 50 turns of No. 22 s. c. c. copper wire. There are nine taps taken from the coil, the first being after the initial ten turns, the others in succession every five turns thereafter. The beginning of the coil is also twisted into tap form, and later connected to the aerial binding post. The holes for the shaft on which the secondary revolves, are drilled 2½ inches from the bottom of the winding. They should be large enough, in the case of a cardboard tube, to take some sort of brass or fibre bushing, as

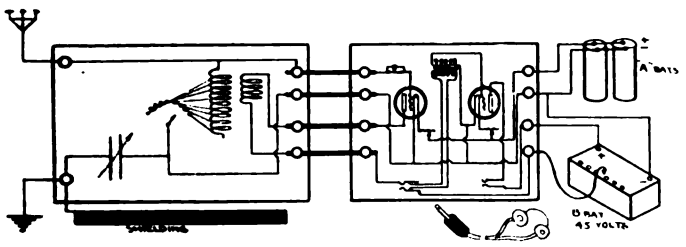

Fig. 4. Schematic diagram illustrating the wiring of the two units. Looks intricate, but is easy when you study it awhile.

shown in the detailed sketch of the primary, Fig. 2. A bakelite tube does not need this bearing surface.

The movable coil is wound either on a ball or on a cardboard tube. Forty-four turns of No. 24 s. c. c. copper wire are required, 22 turns to go on each side of the spindle hole. The spindle, or shaft, on which the rotor turns is of two separate pieces, one of which must be brass or copper tubing. It is through this tubing that the secondary leads come out into the remainder of the circuit. Fig. 3, which is a detailed sketch of the rotor, shows this clearly.

In winding the secondary on a ball, there is an unavoidable break in the wire at the center of the form, where the turns cross over from one side to the other. Starting at any side of the rotor, it is easy enough to wind the 22 turns uphill, but when it comes to crossing over and winding the next 22 turns downhill, the trouble begins. If you cross immediately to the outer edge and begin the second half of the winding as you did the first, you disturb the continuous flow of current through the coil. The only way to do is to start separate windings at each edge, and join the two inside ends at the center of the ball, either inside or outside the form. Be sure that the turns on both sides of the rotor are wound in the same direction.

The assembly of the tuning unit is indicated in Fig. 1. The panel on which the instruments are mounted is 14 inches by 6 inches high. It is of hard rubber or composition board, is lined with tinfoil on its inside face, and is fastened to a wooden base 14 inches long by 6½ inches wide. The tinfoil is to eliminate the disturbing effects of an annoyance known as "body capacity." The foil is cut away at various places so that it does not touch any instrument or part of an instrument. It is cut away from the binding posts and no wires are allowed to touch it. The only connection it has with the remainder of the set is a tinfoil lug which connects the shield with the ground binding post of the panel. Without this connection, the purpose of the shield would be nullified.

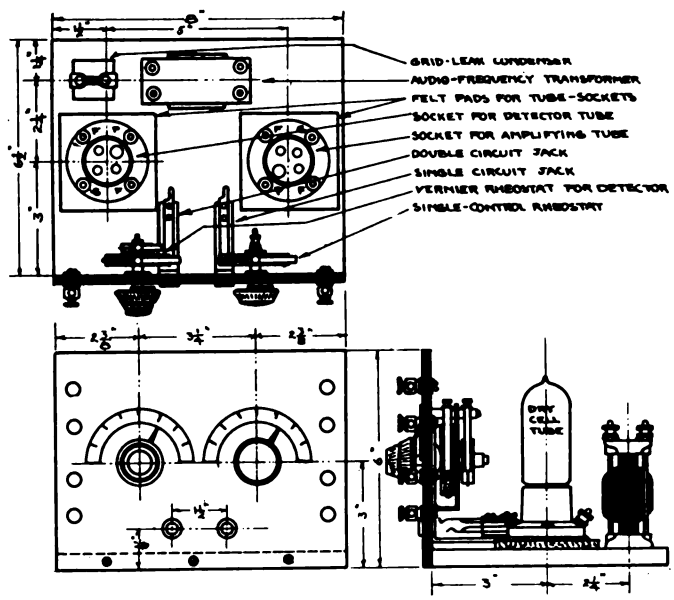

Fig. 5. The detector-amplifier unit, showing arrangement of instruments, as well as dimensions for duplicating the layout.

There are six binding posts on the face of the panel. One each for the aerial and ground on the left edge, and four others on the right edge. These four are the terminals of the tuning unit, and connect with a corresponding four on the left edge of the electron unit. The inside wiring for the tuning unit is shown in Fig. 4, which also continues the hook-up into the second section of this interesting receiver.

The Electron Unit

This unit will appear to the uninitiated to be almost hopelessly intricate. Such is not the case, and after you have read the following explanation and carefully examined Fig. 5, which is an assembly drawing of the electron unit, you will have no difficulty in constructing this particular part of the set. Read slowly and take in every word of the description.

There are two tubes used in this set, both of which

(*Continued on next page*)

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(*Continued from preceding page*)

are dry cell tubes, which do not need a storage battery for their operation. One tube is the detector of radio signals, while the other is the amplifier of those signals. The tubes are exactly alike in mechanical construction, differing only in the use to which they are put. For this use, they are interchangeable. The filament of the detector tube is fed with electricity by means of a vernier rheostat, which permits very gradual increase or decrease of current. A fine adjustment of this nature is necessary for the most efficient operation of the dry cell tube because, when used as a detector, its filament demands are very "fussy." On the other hand, however, a single control rheostat is used in connection with the filament of the amplifying tube, for it has been proved by practice that a close control here is not necessary.

These two rheostats are mounted on the front of the panel so that they occupy the central position. Beneath them are two telephone jacks, the one at the left, underneath the vernier rheostat, being a double-circuit affair, so constructed that when the telephone plug is inserted it automatically cuts out the amplifying tube. The receiver then operates on the detector tube alone. When the telephone plug is withdrawn from the double-circuit device and placed in the other jack, the amplifier gets in the circuit again, and the complete receiver does its utmost.

There are two other instruments left unexplained—the grid-leak condenser and the audio-frequency transformer. The grid-leak condenser, while a small instrument, is a very important part of the set. It is really a combination of two separate instruments, as its name indicates. Both these instruments, the condenser and the grid-leak, are subject to variations according to the particular tube used as a detector, and for this reason, no set value of either capacity or resistance can be given. The proper values can only be hit upon by experimentation. Perhaps a fixed condenser of .00025 mfds. and a variable grid-leak having a range of from one to five megohms, is the best possible combination. An instrument containing these values can be readily purchased.

The audio-frequency transformer is a matter of choice. There are six or seven types on the market which have been designed especially for use with the dry cell tube. These are, of course, the latest design in transformer construction embodying refinements and improvements not found in earlier models. For this reason these especially constructed instruments are recommended. In buying an audio-frequency transformer ask for and get the very best of its kind. It may cost a little more, but the superior results are worth it.

Mounting all these instruments on the panel and baseboard of the electron unit is a simple matter. The arrangement shown in Fig. 5 is not only extremely neat and symmetrical, but is also expertly designed to give the utmost volume without a quiver of distortion. There are no tube and amplifier noises to this set, excepting those caused by excessive regeneration, which are eliminated by turning down the rheostats. Note that the tube sockets are glued to square pieces of felt, which in turn are glued to the baseboard. These pads, about ½-inch thick, take up the shocks due to knocks and bumps and also eliminate the annoying metallic sounds which would otherwise come from the dry cell tube. To aid this elimination, the wires going to the four binding posts of the tube socket are of flexible material.

The back-panel wiring, while honestly intricate, is not beyond the ability of the modestly ambitious amateur. Fig. 4 gives the hook-up as adapted to the construction of the electron unit, showing eight binding posts on the face of the panel, four of which connect the unit to the tuning panel, while the other four are for the two batteries, the "A" and the "B." The "A" battery consists of two No. 6 dry cells connected in parallel as shown so that their combined output does not exceed 1½ volts. The "B" battery is a 45 volt cell with the usual taps for varying the output. The entire "B" battery current is used in the plate circuit of the amplifier, but the amount which goes into the plate circuit of the detector is varied by a flexible wire which comes from the lowest of the four battery binding posts and goes to the taps of the "B" battery as required.

As an aid in tracing the connections the entire hook-up is given in Fig. 6. In this form it is perhaps more familiar to the reader. To make it more so to those who may not know offhand the radio symbols, the names of the various instruments are given along with the conventional signs.

Now for Results!

The particular set described above was made for Mr. Harold Slater, of Fall River, Mass. With a single wire aerial eighty feet long and thirty feet high, he received consistently all stations within the area bounded by a circle drawn through Kansas City, Mo., and Havana,

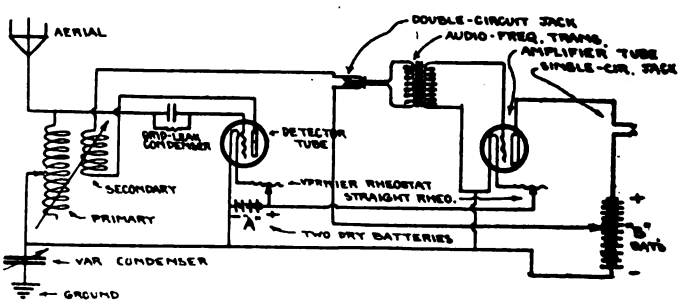

Fig. 6. Hook-up used in the set described in the accompanying article. It is highly selective as well as simple to operate.

Cuba. The range of this set, therefore, is approximately 1,500 miles, enough to reach half-way across the continent from either coast. The volume with which stations not over 500 miles distant were received made it possible to use a horn, a conch-shell, or a small megaphone for loud speaking, attached of course directly to the phones. With such an arrangement music could be heard plainly across a 30-foot room. These results are yours for the trouble—or the fun—of building a duplicate of Mr. Slater's neat and efficient outfit.

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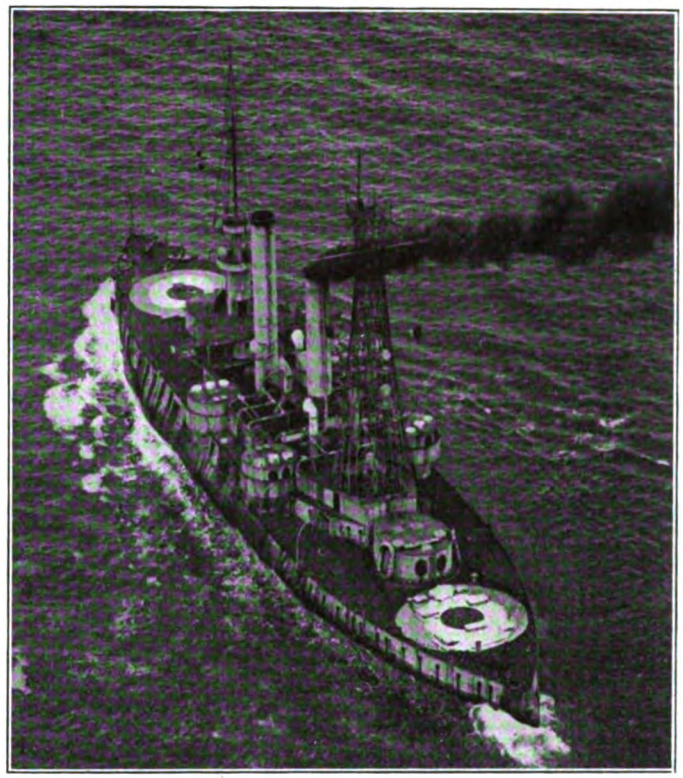
"Iowa" is Dead, But Radio Control Secrets Live

THE U. S. S. "Iowa," first radio controlled battleship in the world, went to a gallant death last week in the deep reaches of Panama Bay, sunk by gunfire from her younger but more powerful sister, the U. S. S. "Mississippi." Her flag was not flying—naval guns are never trained on the flag—though she was still an American vessel designated as Coast Battleship No. 4. She was sacrificed in the interests of radio control and naval gunnery.

Her loss amounts to nothing, however, compared with the results of the radio control experiments carried out successfully, and although she carried some valuable and confidential radio control instruments, the radio experts of the navy say no secrets were lost. They had learned all that was possible about controlling the old battleship, so she was turned over to the gunnery and ordnance experts as a mobile target.

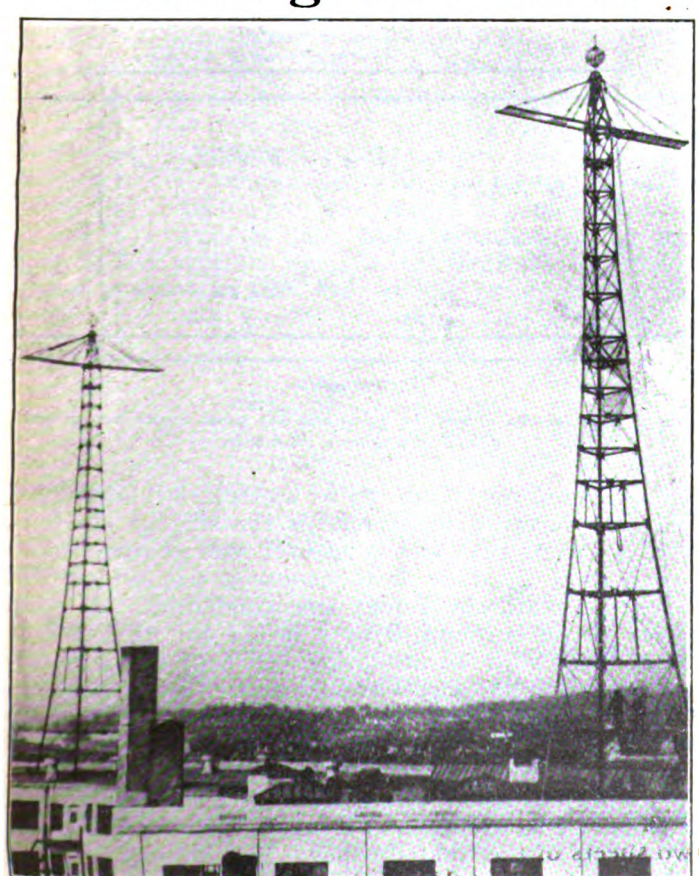
Within a short time another ship could be fitted with radio control, and it is understood that many improvements are planned. Rumor has it that one of the laid-up destroyers will probably soon be assigned for radio control experiments and equipped with highly improved apparatus. But which of these fast scouts of the navy will be used has not been decided. Only the allotment of funds and a month or two of time are needed, it is understood. Radio equipment is ready awaiting assembly and installation. By equipping for radio control a high-speed vessel, capable of making at least twenty knots excellent practice could be given the gunners of the navy, it is claimed. The ship would be controlled from a mother craft by radio and maneuvered while under fire.



(Navy Official Photograph)

The U. S. S. "CB4," first radio controlled man-of-war, formerly U. S. S. "Iowa," sunk during naval maneuvres in Panama Bay.

Washington Gets RCA Broadcasting Station



(C. International Newsreel)

New Washington, D. C., Broadcasting Towers.

PRACTICALLY the whole continent will be able to hear a new broadcasting call, as yet unassigned, when the RCA station at Washington, D. C., opens up in June. Other than that the station will be of the highest order and latest type, the Radio Corporation refuses to state. Judging from rumors, however, its voice should reach to every corner of the country as well as some of the insular possessions. The new station is located at 14th Street and Park Road known in Washington as Mount Pleasant.

Through the co-operation of the Riggs National Bank and Chas. H. Tompkins, two one-hundred foot fabricated steel towers have been erected on the roofs of the Riggs and Tompkins Buildings in the highest section of Washington where they will serve as new and modern landmarks for the Capital.

The towers have a slight curvature which will give them somewhat the appearance of small Eiffel towers. Their construction is unusual, in that they have three legs instead of the customary four. This reduces wind resistance and makes for stability. A thirty-six foot cross-arm near the top of each tower supports four antenna wires each twelve feet apart. The distance between the towers is 220 feet and the effective radiating length of the antennae 160 feet.

The studio, the reception, transmitting and apparatus rooms are on the second floor of the building. Two motor-generator units will insure an adequate power supply and two tube transmitters will make possible flexible, smooth running programs. It is hoped that the station will be in operation and ready to serve Washington and the surrounding territory within two months.

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Telephone Type Condensers of Large Size

By C. White, Consulting Engineer

THE recent development of reflex and other more advanced types of circuits has required the use of rather larger size condensers. Previously the amateur radio fan has been concerned only with condensers up to .006 micro-farads as a very large size. The employment of .25 and .5 condensers was practically unkown for the average use in receiving apparatus until the desirability of confining audio- and radio-frequency currents to certain parts of the circuit and prevent them from wandering where they were of

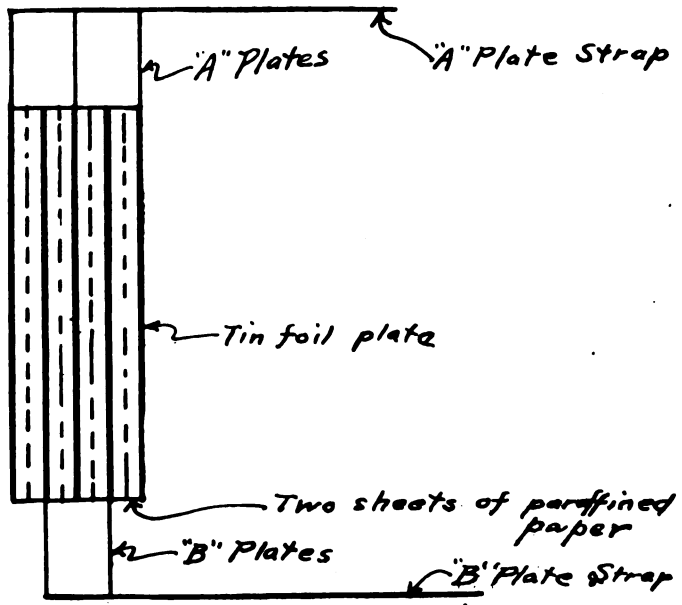

Fig. 1. Diagram showing general method of construction in "piling up" a condenser.

little or no value to the working of the circuit was apparent. In other words, these large condensers are only used as by-pass condensers and not for tuning. Owing to the fact that their employment in amateur radio reception is quite recent it is difficult to obtain them from the ordinary radio dealer; but within a short time I am confident that a .5 mfd. condenser will be as easy to get as a .006. In telephone work, however, the use of relatively large capacities has been constantly practiced since the earliest days of telephone application.

It is an almost common belief that the capacity of a condenser is solely dependent upon the number of plates. This is quite wrong, because the thickness of the insulation and the quality of the insulation are equally as important factors. It is possible to purchase a 43 plate condenser that has less capacity than another 23 plate size. The formula for the design of a condenser is as follows:

$$C = \frac{2.25 \times K \times S \times (N-1)}{10{,}000{,}000 \times D}$$

Where: C is the capacity in microfarads desired.
S the area of one side of a plate.
N the total number of plates.
D the thickness of insulation between two adjacent plates.
K the dielectric constant for the insulation used.

From the above formula it is at once apparent upon which factors the capacity of the parallel plate type of condenser depends. It can be noticed that as we increase S, the plate area, the capacity will be directly increased, and likewise as the number of plates is increased the capacity increases. But as we increase the thickness of the dielectric or insulation D, the capacity becomes less. Then it is quite evident that to obtain a high capacity the thickness of the insulation should be as small as possible, the dielectric constant K should be large, the number of plates should be a maximum, and the area S of one side of a plate must be augmented, until the desired size is obtained. The values of the terms in the equation are in inches and square inches.

Now, for example, let us take the design of a particular size of condenser and run through the complete analysis. Say that it is desired to construct a .25 microfarad condenser. The first thing necessary is to choose the kind of dielectric or insulation to be used, its thickness, the size of the plates, and then from the formula we can easily substitute and determine the number of plates or layers the condenser must have in order to give the wanted capacity. Mica is the ideal substance to use for an insulator, but owing to its high cost it is almost prohibitive. A mica insulated condenser of high capacity, such as 1.0 microfarad, would cost about $15 or more. Hence we must use another substance which is not so good electrically, but less expensive and still capable of serving the purpose. Such a substance is oiled or paraffined paper. This paper can be prepared from a sheet of ordinary heavy tissue paper which is dipped in hot paraffine and allowed to dry. It will be necessary to use two sheets of paraffined tissue paper between two adjacent plates owing to the thinness of one sheet. For plates, thin tinfoil can be used. The

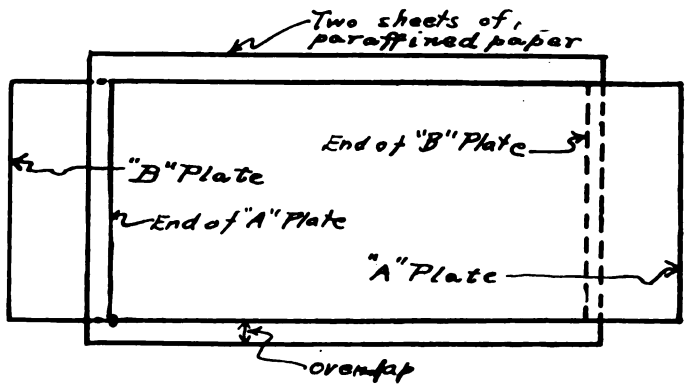

Fig. 2. General idea of how the tinfoil and wax paper should be cut and placed in making a condenser.

dielectric constant, K, for paper so treated is about 2.5. The next factor to determine is the size of plate, S. If S be small then the condenser will require more layers, so it is advisable to choose a size which will make the most convenient size condenser. A good choice would be about 2 by 4 inches for effective or contact area with the insulation. Of course, the actual size of the tinfoil sheets should be two by 4½ inches in order to allow enough tinfoil overhanging to strap the A and B groups together as illustrated in Fig. 1. Now let us substitute in the formula and solve for N, the number of layers or plates. K is 2.5 for paraffined paper; S we have chosen as 8 square inches; and D, for two sheets of the treated paper is .002 inches. Solving for N we find that 111 sheets of tinfoil are necessary.

(Continued on next page)

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A Remarkably Simple, Efficient and Flexible Receiving Set

By Robert L. Dougherty

WHEN a man designs a set he tries to accomplish three important things in his construction. The first is efficiency, the second is simplicity, and the third is flexibility. If he can make a set embodying all of these he is perfectly satisfied with himself and also with his results.

A set that embodies all these fine points, as well as quite a few others, was recently built by A. S. Mawhinney, 801 Riverside Drive, New York City. The set itself at first glance would seem to be the conventional three unit honeycomb coil receiver, but upon further inspection, quite a number of novel features assert themselves.

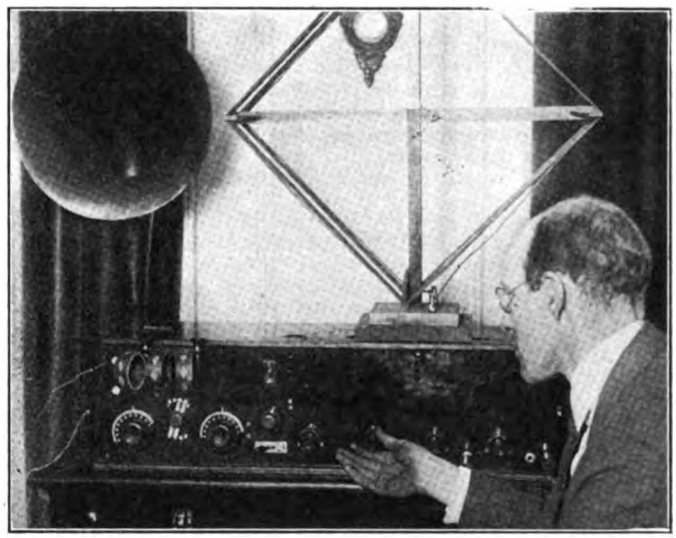
One of the remarkable points of this set is its absolute absence from capacity squeals and howls, and even thought regeneration is used, the coils and condensers can be handled without fear of even detuning distance stations which is an accomplishment in itself.

The set proper when analyzed for flexibility, is really three sets in one, all controlled by means of a single switch. First, it is an extremely efficient three-unit honeycomb regenerative set, which can be used with aerial and ground. With this phase, two steps of audio-frequency can be used. Next, by means of the switch shown in the illustration herewith next to the right hand condenser dial, one can throw on two stages of radio-frequency and use either antenna and ground, with regeneration, or a loop. Then last but not least, it can be used as a triple loop circuit set, by simply removing the honeycomb coils, and plugging in a special loop. The remarkable ease with which any of these circuits are used, and also the remarkable efficiency with which it works, make it a wonderful set.

In the March 24th issue of RADIO WORLD, on page 11, under the heading of "A Fire Escape Antenna" an illustration of the inside of this set was shown. By referring to the picture, it will be seen that five tubes are used. The anti-capacity switch is located directly under the first tube and next to the condenser, and permits either detector and audio-frequency, or radio-frequency, detector and two stages of audio.

Over 112 stations have been copied with this set, using a loop antenna and as is the habit of the builder, phones are taboo, the loud speaker being used exclusively. All long distance reception has been verified by telegram. The furthest reception is Los Angeles, which has been heard clearly on the loud speaker, and a telegram testifies to the fact that the reception was not just a freak, as it has been done numerous times.

Another remarkable feature of the set, and one that is important is the fact that although five tubes are used, there are only 45 volts used on the plates, and although 60 to 100 can be used, it functions efficiently on 45. The Los Angeles reception was accomplished on that plate voltage. In combining radio-frequency with regeneration, it is remarkably quiet, and there is a brilliance to the signals that is startling. The reception is entirely free from tube noises, such as crackling, squealing and howls, which is due to the method of hooking up the transformers, and also the method of mounting them on the sub-panel.



(C. Kadel and Herbert)

A. S. Mawhinney operating the set on which he heard Los Angeles, Cal., from New York City.

When a man can construct a set that is flexibility itself, free from all capacity howls, (you can't make this set howl except by turning the filaments up too bright), and is as efficient as this one is, he truly can say that he has accomplished his aim.

(Continued from preceding page)

But, for average use, it would be close enough to build the condenser by placing on layers until the whole condenser has reached a certain thickness. With thin tinfoil about .0005 inches in thickness, the whole condenser would have to be built up until about ¼-inch thick.

The actual construction data is as follows: Cut 2¼ by 4¼-inch strips from a sheet of the prepared paper, and cut 2 by 4½ strips of tinfoil. Start laying the condenser as shown in Fig. 2, taking especial care throughout the construction to see that in no place do the A and B groups of plates touch each other. The paper should be allowed to overlap the two sides of the plates that are not used for the connecting straps so as to prevent short circuiting two adjacent plates or sheets of tinfoil. Start with a sheet of tinfoil, then two sheets of paper, then another sheet of foil of the B group—that is, with the end hanging over on the other side. About every third tinfoil sheet it is advisable to roll or press the excess paraffine out of the paper by means of a rolling pin or similar object. After the desired thickness has been reached, the condenser can be made rigid by placing two sheets of heavy cardboard on end side and tying the same tight, thus keeping the condenser pressed together. After the plates are strapped together, thus forming the A and B groups, the whole condenser can be placed in a paper or wooden box which can be filled with paraffine to keep moisture out.

If it is desired to construct a condenser four times larger than the one just described it is only necessary to lay plates and paper until four times the thickness has been attained. If it is desired to make one only one-tenth as large the thickness should only be about one-tenth the size of the .25 mfd., condenser. Other sizes can be made in similar proportions.

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Second Radio Conference Recommendations Accepted by Secretary Hoover

SECRETARY HERBERT HOOVER, of the Department of Commerce, last week issued the following official statement which is of great importance to all radio users and enthusiasts:

The recommendations by the Radio Conference represent a step in ideal development of measures for the prevention of interference in public broadcasting.

The report recommends making available all wave lengths from 222 to 545 meters for public broadcasting, the various possible bands to be assigned to different stations so as not only to reduce direct interference but also to build up zonal regions of distribution.

The department fully accepts the recommendations of the conference, but there are a number of difficulties in placing the plan abruptly into action: First, the hardship that it may cause to various stations to move arbitrarily to new wave lengths; second, the difficulties introduced by the ship-to-shore communication which are now working to some extent on 300 meters and also on 450 meters.

The conference recommended that the ultimate development for ship communication be to assign for the general purpose of shipping the whole wave area from 600 to 800 meters, different bands being allotted within this area for different shipping purposes. The distress signals from ships now work on 600 meters and the radio compass works on 800 meters. The ship-to-shore communications on 300 and 450 meters are altogether commercial traffic and would be more advantageously carried on with less interruption than today if these services were given the entire field around 700 meters.

In order to make progress in this direction of developing the area from 600 to 800 for ship communication, it is proposed that all ships and all shore stations used for ship communications shall cease using 450 meters between the hours of 7 and 11 p. m., but may use 700 meters at this or any other time. The 300 meters wave length now assigned under the International Convention is very little used and will be used for inland broadcasting, and it is not expected that the ships will avail themselves of the International Agreement in this particular, as it has not proved of practical advantage except to a limited extent.

For internal broadcasting the department proposes to cooperate with the various stations with a view to developing a systematic assignment of wave lengths to the various stations within the broad confines of the recommendations of the conference. In order to carry this out without hardship the following classification of stations will be made:

Class A stations—that is, stations equipped to use power not exceeding 500 watts. In this class it is proposed that the radio inspectors, in cooperation with the station owners, shall assign distinctive wave lengths to each station so far as is possible in the area from 222 to 300 meters. No station will be required to change from 360 unless it so desires.

Class B stations—that is, stations equipped to use from 500 to 1000 watts. In this class it is proposed to similarly offer to license these stations on special wave lengths from 300 to 345 and from 375 to 545 meters, having regard to the maintenance of some ship work on 450 meters as outlined above and again no station will be required to change from 360 unless it so desires.

Class C stations—comprising all stations now licensed for 360 meters. In this class no new licenses will be issued for stations on 360 meters until the plan is entirely realized. Stations which do not wish to move under the general plan may remain at 360 meters, but they will necessarily be subject to some interference at best. It is thought that by the above plan the stations can be gradually brought into accord without hardships.

Under the plan amateurs are given the whole area from 150 to 220, instead of being fixed upon 200 with special licenses at 375. The special licenses hitherto issued for amateurs at 375 will now be issued at 220. Certain special cases will be taken care of otherwise. It is proposed, in cooperation with the amateur associations, to develop an assignment of wave bands in classifications so as to somewhat relieve the present interference among amateurs. It will be remembered that the number of wave bands which can be used among the short wave area assigned to the amateurs is greater in proportion than among the longer wave lengths, and these arrangements expand in the area hitherto assigned to amateurs.

Seven New Broadcasting Stations Licensed

Seven new broadcasting stations were licensed on 360 meters during the week ending March 31. They are as follows:

Call	Station	
KFGL	Arlington Garage, Arlington, Oregon	5 watts
KFIF	Benson Tech. Student Body, Portland, Oregon	200 watts
WWAJ	Columbus Radio Club, Columbus, Ohio	10 watts
WRAK	Economy Light Co., Escanaba, Mich.	200 watts
KFFR	Kirk, Jim, Sparks, Nevada	10 watts
WRAS	Radio Supply Co., McLeansboro, Ill.	20 watts
WSAP	Seventh Day Adventist Church, New York City	250 watts

The following 29 broadcasting stations were deleted during March:

Call	Station
KHD	Aldrich Marble & Granite Co., The C. F., Colorado Springs, Col.
WEAW	Arrow Radio Laboratories, Anderson, Ind.
KFGG	Astoria Budget, Astoria, Ore.
WMB	Auburn Electrical Co., Auburn, Me.
KFCC	Auto Supply Co., Wallace, Idaho.
WEAC	Baines Electric Service Co., Terre Haute, Ind.
KXS	Braun Corporation, The, Los Angeles, Cal.
WCAP	Central Radio Service, Decatur, Ill.
KDYV	Cope & Cornwell Co., Salt Lake City, Utah.
KNX	Electric Lighting Supply Co., Los Angeles, Cal.
KFBV	Ford, Clarence O., Colorado Springs, Col.
KDZM	Hollingworth, E. A., Centralia, Wash.
KON	Holzwasser, Inc., San Diego, Cal.
KQP	Hood River News Co., Hood River, Ore.
KLP	Kennedy, Colin B. Co., Inc., Los Altos, Cal.
WAH	Midland Refining Co., El Dorado, Kan.
WDAH	Mine & Smelter Supply Co., El Paso, Tex.
WLAM	Morrow Radio Co., Springfield, Ohio.
WRAJ	Pickering Co., M. H., Pittsburgh, Pa.
WOAQ	Portsmouth Radio Ass'n, Portsmouth, Va.
WBAB	Potter, Andrew J., Syracuse, N. Y.
KDZQ	Pyle, William D., Denver, Colo.
WGAB	QRV Radio Co., Houston, Tex.
KFAS	Reno Motor Supply Co., Reno, Nev.
KDZL	Rocky Mountain Radio Corp., Ogden, Utah.
WFAS	United Radio Corp., Fort Wayne, Ind.
WFAD	Watson, Weldon Motor Supply Co., Salina, Kan.
KOG	Western Radio Electric Co., Los Angeles, Cal.
WOAY	Wilder, John, Birmingham, Ala.

Broadcasting Continues Popular

DURING the month of March broadcasters increased to 609, but 29 withdrew and their licenses were cancelled leaving, with 21 new stations licensed, a total of 580 operating stations. Of these, thirty are Class B stations on 400 meters and the balance on 360 meters. There they will remain until applications for transfer to the two new classes are received and they are "sorted" out and assigned new waves by the Department.

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Resolutions Adopted by the Second National Radio Conference

AT the conclusion of the Second National Radio Conference, recently called to meet in Washington, D. C., by Secretary Hoover, of the Department of Commerce, the following resolutions were adopted and have just been promulgated by the Department of Commerce:

That this conference, and the Department of Commerce subsequently, follow the practice of expressing wave frequency in kilocycles per second, with wave length in meters in parentheses thereafter.

That in assigning a wave band of 10,000 cycles to each Class A broadcasting station they be distributed over five zones throughout the country such that no stations in adjacent zones are closer together in frequency than 20 kilocycles, and that within each zone there be ten stations separated by 50 kilocycles.

That only one wave frequency be assigned to a Class A broadcasting station, which should transmit exclusively on the wave frequency designated and reserved exclusively for that station.

That every broadcasting station should be equipped with apparatus as a tuned circuit coupled to the antenna and containing an indicating instrument or the equivalent for the purpose of maintaining the operating wave frequency within 2 kilocycles of the assigned wave frequency.

That the Department of Commerce establish qualifications for Class A broadcasting stations, including a general minimum and locally suitable maximum power and a quality of program that will warrant assignment of a territorial wave frequency to each particular station, and that the qualifications be similar to those required of the present Class B broadcasting stations.

That the Department of Commerce in its discretion assign Class B broadcasting station licenses in which wave frequencies shall be specified and in which the power ratio between the Class A and B stations shall be at least 2 in so far as is practical for a given locality.

That in granting licenses it is recommended that the Department of Commerce limit the use of power where undue interference would otherwise be caused.

That reading of telegrams or letters by broadcasting stations be not construed as point to point communication so long as the signer is not addressed in person and so long as the text matter is of general interest.

That simultaneous re-broadcasting shall be permitted only on a broadcasting wave frequency, and with the authorization of the original broadcaster and the Department of Commerce.

That the Department of Commerce be requested to insist upon the suppression of harmonic and other parasitic radiation from all radio stations, as for example, by requiring the installation, if necessary, of coupled circuit transmitters at the earliest feasible date.

That spark transmitting apparatus be replaced as rapidly as practicable by apparatus which will produce a minimum of interference.

That the amateur organizations of the United States study the time requirements of the broadcasting of religious services on Sunday and by mutual arrangement with the broadcasters determine upon silent periods which will make possible the reception of such religious services in any given locality.

That when the government conducts services similar to commercial services for which waves or wave bands have been assigned, the government stations shall use the said waves or wave bands.

That the Government have the exclusive use of a band one kilocycle wide centered at each of the following frequencies, 92, 83, 81, 78, and 76 kilocycles, so far as is consistent with public service generally.

That where a line-radio installation produces interference with the reception of signals from beyond the state such line-radio station shall require a license from the Department of Commerce.

That the subject of interference caused by devices not used for radio communication purposes and which are not subject to the present radio law be referred to the projected Sectional Committee of the American Engineering Standards Committee and that in the meantime the members of the conference offer to the Department of Commerce their cooperation in the solution of such immediate problems as may be of a character in which their aid could be of value.

That, in the judgment of the Second National Radio Conference, the prevention of "wilful or malicious interference," as provided for by Section 5 of the Act of August 13, 1912, and the minimization of interference, as provided for by Article 8 of the International Convention, require that the Department of Commerce shall, in its discretion, withhold or rescind station licenses to transmit on specified wave frequencies, at certain times, and on definite powers, and with certain types of transmitters and when, in the judgment of the Department of Commerce such interference would result or does result; and that it is the clear and manifest intent of Section 1 through 4, and Regulations 10, 12 and 18 of Section 4 of the said Act to give the Department of Commerce such authority to withhold or rescind licenses where such interference will result or does result; and that the Second National Radio Conference believes that a decision by the Courts validating the above views will be greatly in the public interest; and that the Second National Radio Conference expresses its willingness to advise and assist the Department of Commerce in the support of the above resolutions in the event of litigation.

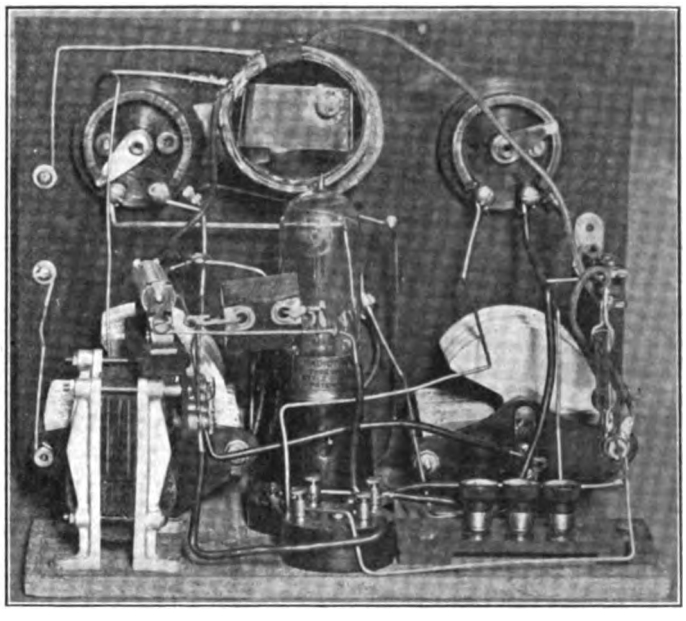
That a copy of the foregoing motion be sent to each concern, organization or association engaged in manufacture of radio equipment, or broadcasting by radio or otherwise interested in radio communication with a request for an expression of approval or disapproval of the motion and an agreement to abide by its provisions.

That the Second National Radio Conference desires to emphasize the limited facilities available for radio broadcasting, and the uneconomic and tentative basis of present-day broadcasting, and that the Conference urges the consolidation in each locality of those desiring the establishment or maintenance of broadcasting and those interested in broadcasting in that locality; to the end that broadcasting conducted in each neighborhood by such a local association will receive public support and be handled in an economic and permanent fashion.

That the great expansion of radio communication has not been accompanied by a proportional increase in the radio personnel and facilities at the disposal of the Bureaus of Navigation and Standards of the Department of Commerce, and that the resulting strain on the inspection and technical forces of the Department of Commerce has been excessive, and has even forced the omission of important activities and investigations, and that the Second National Radio Conference strongly recommends that additional appropriations be granted to the Department of Commerce for its radio inspection personnel and equipment and for its research personnel and facilities. That a committee of three be appointed to wait upon the Secretary of Commerce to present the urgency of this need and the importance of the early provision of funds for these bureaus.

That the present conditions of radio interference with non-local reception and the resulting public dissatisfaction urgently require that the recommendations of the conference be accepted by the Secretary of Commerce and put into early operation by the Department of Commerce.

Lionel Bigman's One Tube Set



(C. Kadel & Herbert)

This one-tube reflex set, built by Lionel Bigman, of New York City, is inexpensive and well worth constructing. It uses a fixed crystal for detector and one tube with reflex action on the plate circuit. For DX reception this set is especially good and remarkable results have been obtained. Local stations have been heard 50 feet from the phones on the loop.

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The Functions of the Grid Condenser

By W. S. Thompson, E.E.

GRID condensers can be purchased for such a small sum that many radio enthusiasts neglect this most important part of their receiving set. It is the purpose of this article to discuss the functioning of this piece of apparatus and to clear up some misunderstandings prevalent concerning its use.

As most radio fans are familiar with the theory of a triode vacuum tube, the author will assume that all

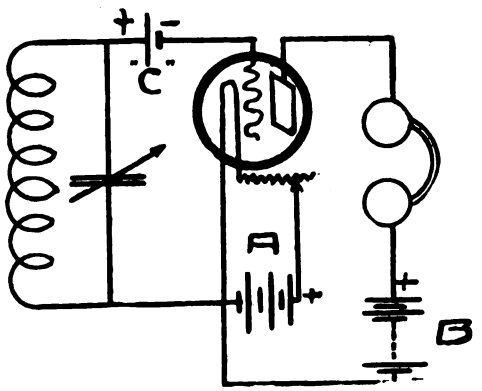

Fig. 1. Fundamental circuit for connecting triode vacuum tube as a detector without using a grid condenser.

his readers understand how a change of potential on the grid controls a flow of current in the plate circuit. Before the grid condenser was first applied to a radio receiving set, the vacuum tube was used as a detector in an entirely different manner than is customary today. The lead from the secondary of the coupling transformer was taken directly to the grid as shown in Fig. 1, using a "C" battery to keep the normal potential of the grid negative with respect to the filament. In order to explain how this arrangement detected and rectified signals, it will be assumed that the signals consist of a series of wave trains as shown in Fig. 2. As this series of wave trains might represent a modulated sustained wave, the discussion will apply equally well for code or phone transmission. Fig. 3 consists of a plate current-grid potential characteristic curve of a modern receiving tube plotted in the conventional manner. The vertical line, E′, represents the normal grid potential as fixed by the C battery in the grid circuit. The horizontal line I′ represents the current flow

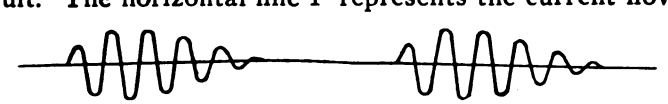

Fig. 2. Conventional method for representing a series of wave-trains sent by a transmitting station.

in the plate circuit when there are no signals being received. An incoming wave train has been plotted on the line E′ and the effect of this incoming wave on the plate current has been plotted on the line I′. A careful examination of the curvature of the characteristic curve will show that when the grid is made positive by a positive half-cycle of the incoming wave, the effect upon the plate current is to increase it more than it is decreased by the grid being made negative by a negative half-cycle. The result of this is that the average value of the fluctuations of the plate current is increased above normal as shown by the dotted line. This increase of the average value of the plate current causes the diaphragm in the telephone to move, and hence causes a sound. The frequency of this sound wave depends upon the number of wave trains received per second. It can be seen, therefore, that due to the sharp knee of the characteristic curve at the operating point the very high frequency radio waves are converted into an audio-frequency sound in the telephones. The normal potential of the grid with respect to the filament is kept negative in this case in order to keep the operating point on the lower knee of the characteristic curve.

When a grid condenser with a grid leak is inserted in the grid circuit, an entirely different action takes place, although it accomplishes the same result. Fig. 4

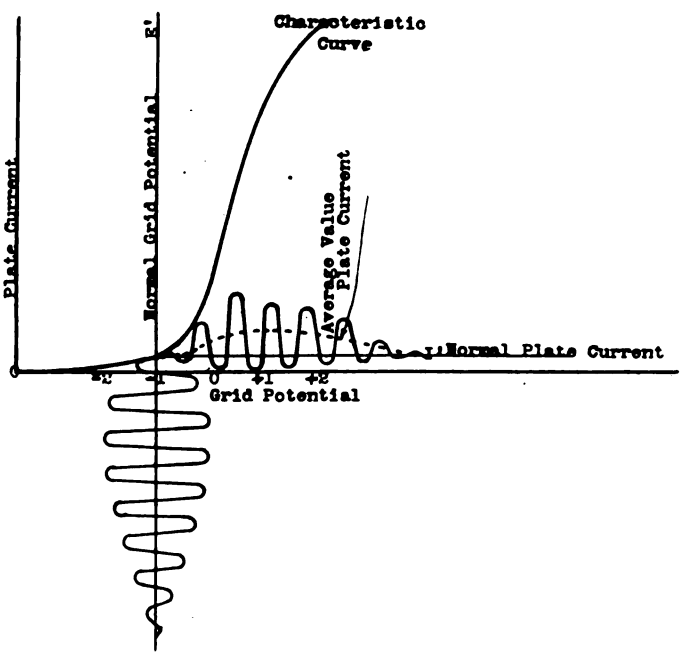

Fig. 3. Plate current-grid potential characteristic curve of triode tube showing rectification of an incoming wave-train.

gives the fundamental hook-up, using a grid condenser in conjunction with the tube to detect signals which will again be assumed to consist of a series of wave trains in order to simplify the discussion. It should be noted that the grid circuit is connected to the positive terminal of the A battery and that there is no C battery used to maintain the potential of the grid at any value. Fig. 5 consists of the grid current-grid potential characteristic curve of a receiving tube, because it is upon the shape of this curve that the detecting action depends. The normal potential of the grid depends upon the value of the grid leak and the RI drop in the filament, so that they should be of such a value that

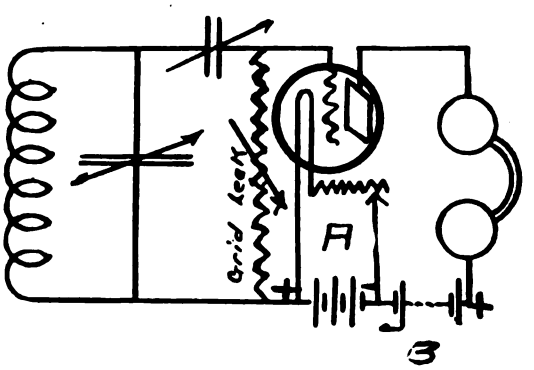

Fig. 4. Fundamental circuit for connecting triode vacuum tube as a detector using a grid condenser with leak.

(Continued on next page)

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Just to be in Fashion

If each page of this week's issue of RADIO WORLD were to be placed end to end the edition would reach from Times Square, New York City, to the Post-Dispatch Building, St. Louis, Mo.

The amount of ink used on this week's issue of RADIO WORLD, represented by the same amount of black paint, would be sufficient to paint the New York City Hall and the Aquarium, San Francisco, Cal.

If each revolution of the three presses that were required to print this week's issue of RADIO WORLD were reduced to running footage it would cover the distance between New York City and Portland, Ore.

We do not guarantee that these figures are correct, but as it is the fashion these days for publishers to make such comparisons, we offer them as interesting if not particularly precise.

(*Continued from preceding page*)

the operating point on the curve will be at P. This point P being on the sharp knee of this curve, it will be seen that a positive half-cycle of the wave train will cause a larger increase of grid current than a negative half-cycle will cause a decrease of grid current. This action will cause an accumulation of negative electrons on the grid side of the grid condenser and this accumulation of negative charges will make the potential of the grid negative and hence cause a decrease of plate current. When a wave train has passed and been rectified, the negative charge will leak from the grid condenser through the grid leak and the potential of the grid will again become normal. Thus it can be seen from Fig. 6 that each wave causes a decrease of plate current, the frequency of which depends upon the number of wave trains received per second.

Comparing the two methods, the reader will note that with no grid condenser, the detector action depends upon the operating point on the plate current-grid potential curve and that each wave train causes an increase of plate current, while the detector action using a grid condenser with a grid leak depends upon the operating point on the grid current-grid potential curve, and that each wave train causes a decrease of plate current. The majority of modern receiving sets use the grid condenser method because it is more sensitive, using the receiving tubes which are available to the average amateur. However, some of the oxide-coated filament tubes would be better detectors using the no grid condenser method.

In designing the grid condenser and grid leaks, there

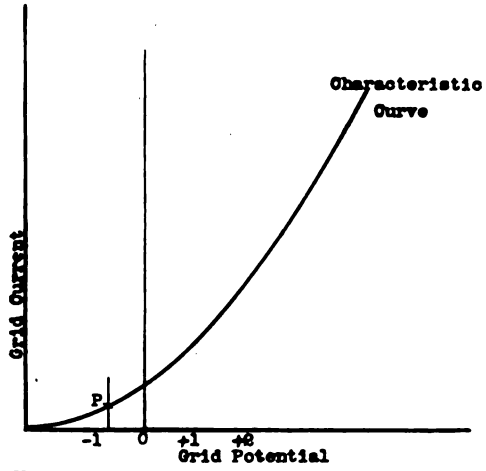

Fig. 5. Grid current-grid potential characteristic curve of a triode vacuum tube showing operating point on knee of the curve.

are several very important factors which must be considered and a great many more which affect the operation of the tube in one way or another but are not important enough to materially decrease its efficiency. The grid condenser must be designed to conform to two limits; that is, it must be small enough so that the accumulation of negative charge will materially affect the potential of the grid and also it must be small enough so that the accumulated charge will leak off during the time between wave trains. The other limiting factor is that the condenser must be large enough so that it will not rob the grid of signal voltage. If the capacity of the grid condenser was too small the signal voltage across the grid-filament would be very small due to the fact that when two condensers are in series with a source of electromotive-force the voltage across each is inversely proportional to the capacity of each. In other words, the smaller of the condensers will have the largest voltage drop so the grid condenser should be large enough to give most of the signal voltage to the grid-filament capacity in order to get the largest change of potential on the grid. The values of grid condensers used today are therefore the largest values that will operate efficiently with a given tube.

The value of the grid leak depends upon the value of the condenser used and should be of such a value

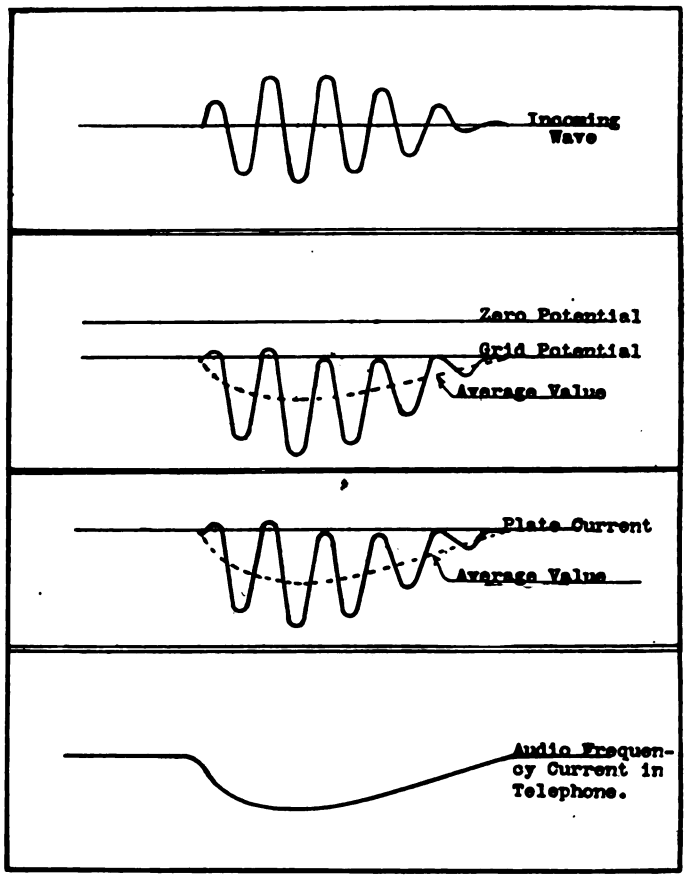

Fig. 6. Showing the effect of an incoming wave on the grid potential and the plate current when a grid condenser is connected in series with the grid.

that the accumulated charge will leak off between each successive wave train without making it so small in resistance that the charge will not accumulate in the condenser.

The only method for obtaining the correct values for the grid condenser and the grid leak without going very deeply into mathematical equations is to experiment with a given tube until best results are obtained.

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Radio and the Woman

By Crystal D. Tector

A YOUNG financier who lives right around the corner from me decided that he wanted a set, but not having money enough to get one conferred with some of his fellow "money masters" and they floated a stock issue to the amount of $25.00. The stock was ten cents per share, and he will have 249 partners in his venture. Of course, the young man will have to be repaid for all his trouble, so the set will be installed in his house, and his partners will have to come over to listen in. Well, J. Pierpont Morgan had to have a start and radio evidently gave this young man an idea in high finance that will benefit him in later life. Just imagine if, 60 years from now, he can look around his spacious office in some downtown bank building and say: "Well, radio certainly gave me this!"

* * *

'Member last week, girls, I threatened to publish my DX letter if I received any encouragement? Well, here I am, and I am proud of it because it was all on one 216A tube, using my Flewelling and a hundred foot antenna without ground: KSD, St. Louis, so loud that I thought it was Ridgewood; WBAP, Fort Worth, Texas; WGM, Atlanta, Ga.; WSB, Atlanta, Ga.; WDAP Chicago, Ill.; WGY, Schenectady N. Y.; KFEP, Denver, Colo.; WMZ, Memphis, Tenn.; WDAF, Kansas City, Mo.; WIP, Philadelphia; PWX, Havana, Cuba, and of course WEAF, WJZ, WHN, WAAM and a score of other nearby stations. Now if some of the girls don't send in some of their DX records, I shall be sadly disappointed as I at least want to publish one letter a week. The editor says that one letter a week is all I can publish, so you had better address me early in the week if you want to get into my column.

* * *

Now that the nice, balmy spring days are coming, F. H. is very loathe to stay in the house, and at the same time he doesn't want to have the loud talker out on the porch. So he ran a couple of wires from the set outside to the rail, and put a couple of weatherproof jacks under the rail. Now he can sit outside in comfort with a pair of phones over his ears and listen to all the concert, and I 'spect he gets thirty winks between programs. He said that the only drawback is that he can't tune it, and has to listen to what I pick out for him. Well, I will use some of that good judgment, and imitate the operator in the Ritz Apartments over in Newark, N. J., and then see if I can't keep him satisfied. You girls understand, of course, how hard that is when he comes home with that "Oh, I'm so tired, go away and let me sleep," sort of a feeling.

* * *

Musical shows are usually dedicated to the "tired business man," but entertainment by radio is claimed as the boon of the "weary working woman" who is characterized no longer as "poor working girl" since the "listen-in" privilege came to her.

While awaiting a conference with a busy man the other day, I chanced to mention radio to his stenographer, momentarily enjoying a breathing spell.

"Oh, gee! Ain't it the grandest thing? You know ever since I got my set, I stay home nights and rest up while I listen in. Night after night I used to think I was enjoying myself dancing my feet off or blinking at the movies. But now, I hit the couch, clamp on the ear muffs and tune her in. This gives my feet and eyes a chance to get rested, you see, and transfers the strain to my ears.

"Believe me, I take it easy nights since radio broadcasting got so good. I know the announcers by their first names and their calls like the typewriter keys. When I get sleepy I turn her off and slide into dreamland."

Radiograms

The Bureau of Standards is trying to discover the cause of certain "dead spots" in the ether which form barriers to successful radio transmission in various areas in the United States.

* * *

The farm strike in Norfolk, England, continues to be accompanied by unusual features. One of these was the use of a wireless broadcast to circulate the appeal of the farmers' union for strike-breakers.

* * *

Thousands of radio fans who were listening in on an opera broadcast by a station in Boston, one evening last week, were surprised when the concert was abruptly discontinued while distress messages from a burning vessel at sea were copied. The opera was resumed after an interruption of fifteen minutes.

* * *

Cold light, the ideal of research engineers, is reported to be a step nearer realization through the laboratory experiments of a young French scientist, Emile Risler. His procedure is to coat glass tubes, drawn to the fineness of a hair-like filament, with a phosphorescent substance and pass an electric current through the tubes, causing them to produce a brilliant light, the color varying according to the phosphorescent material used.

* * *

At a cost of $11,200,000 the New York Telephone Company will erect a new building in New York City on the block bounded by West, Barclay, Washington and Vesey streets. It will be 29 stories high and is expected to be completed by July, 1925. Offices, administration quarters and space for two or three future central telephone exchanges will be provided. In the new building the company expects to accomplish many economies through centralization of personnel.

A radio club is being organized among the local employees of the Standard Oil Company of Ohio at Cincinnati.

* * *

A quartet of trained canary birds is a feature of one of the broadcasting programs. Those birds better be careful not to sing copyrighted notes, or that composers' organization will be after them for a fee.

* * *

Radio is being used by the New York State Tax Commission this year to spread information about the State income tax, which is due on April 15. One talk by experts of the Income Tax Bureau has already been broadcast by WGY, Schenectady, N. Y.

* * *

Harry Holzworth, keeper of the five-mile crib in Lake Erie off Cleveland, Ohio, was last week saved by radio from probable death by pneumonia. His two companions wirelessed for help and a coast guard boat made a thrilling transfer of the sick man to shore.

* * *

A comparatively large part of Edward Cressy's "Discoveries and Inventions of the Twentieth Century" is devoted to the marvelous progress of communication by radio. This book, which is imported by E. P. Dutton & Company, New York City, may be considered as a sequel to "Routledge's Discoveries and Inventions of the Nineteenth Century."

* * *

J. C. Rosenthal, general manager of the Society of Authors, Composers and Publishers of America, Inc., of New York City, said last week that about fifty of the radio broadcasting stations of the country had begun to negotiate with the society for the privilege of continuing to broadcast the copyrighted work of the composers and song-writers who belonged to the organization.

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The Radio Primer

For Thousands of Beginners Who Are Coming Into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Clearly Explained

By Lynn Brooks

WHAT is the difference between series connection and parallel connection of batteries?

When batteries are connected in series the voltage is that of one cell multiplied by the number of cells, but the amperage is that of any one of the cells in the group. When batteries are connected in parallel, the voltage is that of any one of the parallel groups, but the amperage is the sum total of one cell multiplied by the number of cells in the group.

* * *

When should series connection be employed?

Series connection should be used when voltage, or pressure of current, is desired and not amperage.

* * *

When should parallel connection be employed?

If amperage, or quantity of current, is desired from batteries they should be connected in parallel.

* * *

How should dry cells be connected to operate the WD-11 for long life?

As the tube in question only takes 1.5 volts, it is necessary to hook up the cells in parallel. As the life of the batteries is three times as long when two cells are hooked in parallel, it is advantageous to connect them in this way.

* * *

Can six-volt tubes be operated by using dry cells connected in series?

If the tubes are to be operated over a short period of time they can be operated by connecting four dry cells in series, or eight cells in series parallel, but the life of the batteries will be so short that they will last only a very few hours.

* * *

Is it possible to increase the selectivity of a receiver by the use of variable condensers?

By placing a condenser in either the antenna or ground lead of a receiver, a set may be made to tune closer; but if it is not selective, the condenser will not help very much. When a set tunes broadly the general trouble may be credited to distributed capacity, which cannot be alleviated by introducing additional capacity. It is much more efficient to tune a set by inductance than by capacity.

* * *

They use the expression "normal rate of discharge" when talking about storage cells or accumulators. Please explain it.

This expression is meant to express the number of amperes that safely can be drawn from the cell without injury to the plates. To obtain this value, divide the ampere-hour capacity of the cells by the hour rating.

* * *

What is the cause of sulphating of storage cells?

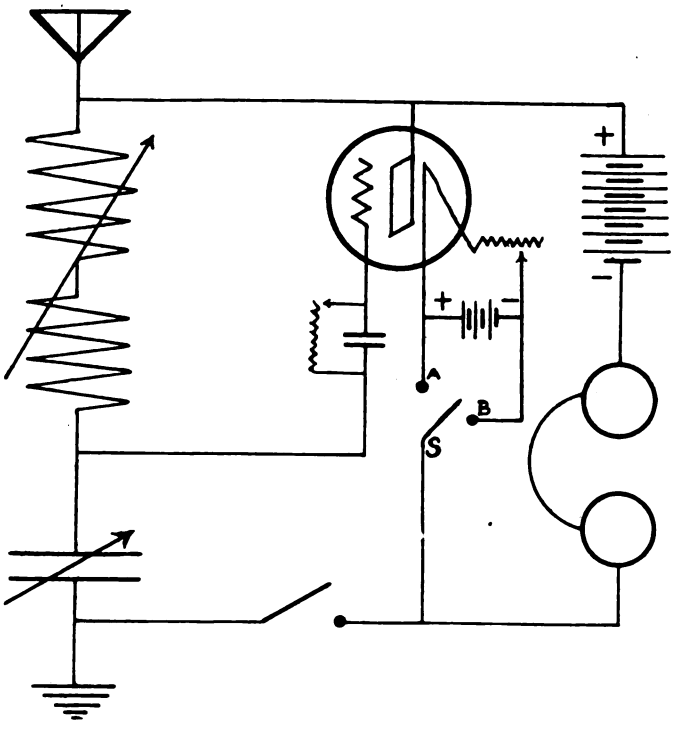
Sulphating is a term applied to a cell when a snow white deposit is formed on the plate. It is due to letting the cells stand too long on discharge, or from serious over-charging.

A 2-in-1 Receiving Set

By S. F. O'Bryan

THE accompanying diagram shows the hook-up of a receiving set designed to work either with or without an aerial. When an aerial is used, switch "S" is placed on point "B" and the switch in the ground lead is closed giving a modified form of ultra-audion circuit that gives wonderful results. The variable condenser then tunes extremely sharp and the grid leak requires close adjustment to obtain the best results.

During heavy spark interference, the antenna may be dispensed with. Switch "S" is then changed to point "A," the other switch is opened, and we have an old tried and true no-aerial circuit that will bring in 'phone and CW through a thunder storm, although the range is, of course, much less than when the first method is used. The inductance between plate and grid now tunes sharply, while the variable condenser and grid leak are less critical.



Hook-up for receiving set to work with or without an aerial.

The average amateur will have no difficulty in making and using this little set as standard parts may be utilized throughout. The variable condenser may have either 23 or 43 plates, and would preferably have a vernier adjustment. The grid condenser and the batteries will be determined by the type of tube used, while the inductance may take any convenient form so long as it can be tuned sharply. A variometer, or a variocoupler with its windings connected in series, will both give good results, but the writer obtained the best results by using two spider-web coils, each wound with 45 turns of stranded wire. This wire was made by twisting six strands of No. 36 wire together, but regular "Litz" would undoubtedly be better. The coils were connected in series as shown, and mounted in the conventional manner to give a variometer tuning effect.

The experimenter who builds this set will find that by using a 1½ volt tube and spider-web inductances as recommended, he can have a remarkably efficient outfit that will be small enough to make a practical vacation time traveling companion.

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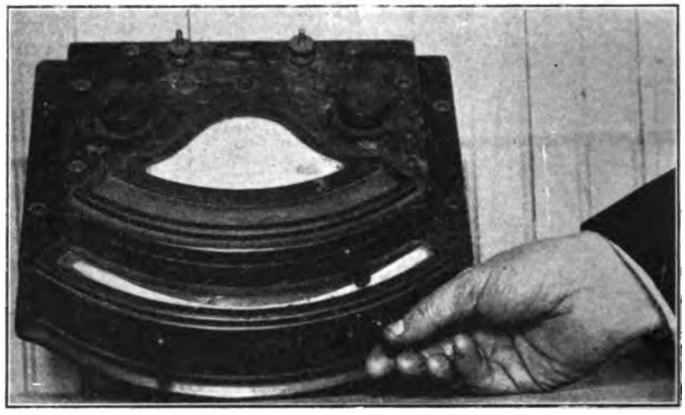
Ubiquitous Camera Me
to Get Radio

(C. Photonews, N. Y.)

Here's an idea put forward by Pierson Mapes. A honeycomb coil in inductive relation with a variometer in a single circuit receiver, and you never have trouble making the signals come pounding in.

(C. Fotograms)

Here it is fellas, the radio set that didn't cost a single penny. Herbert M. Richardson, Minneapolis, Minn., recently made a set out of spare parts as follows: Top of a salad box, six paper fasteners, two paper clips, one safety pin, a piece of galena and some spare wire laying around. Well, when you can go out in the back yard and pick up a radio set, there is no reason for people shying at the very thought of buying one. If you haven't got a back yard, ask your nearest neighbor and maybe he will oblige you by letting you "hunt up a radio set."

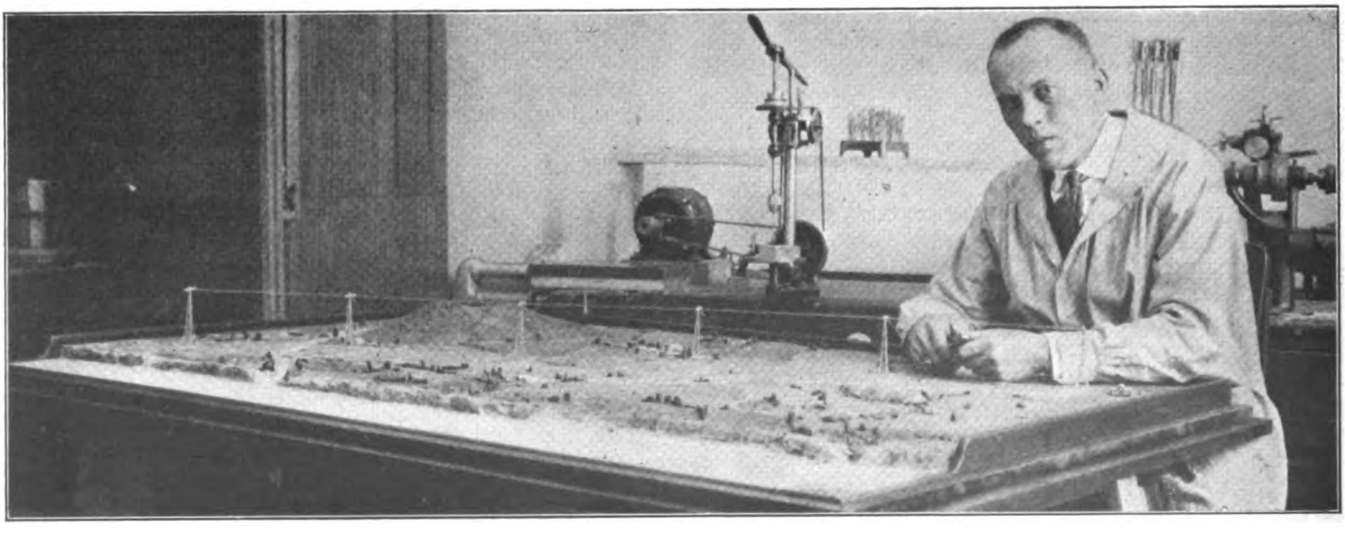


(C. Photonews, N. Y.)

Radio Fans, this is a radio receiver of the vintage of 1904, and was thought at that time to be the very height of perfection. It was used by the U. S. Navy. It is called the Massie "resonophone" and is a three-slide tuner with crystal detector. How different is this dusty antique from the efficient tuners and regenerative sets of today. The only question is, will ours be looked upon in the same manner 20 years from now.

(C. International Newsreel)

Mr. Newton Hill, of Piqua, Ohio, although confined to his bed for 13 years with rheumatism, is not helpless in every sense of the word. He is known as the "Magazine Man" because of the fact that he solicits magazine subscriptions via mail and makes a good living. He recently had a powerful receiver installed to keep his quiet hours pleasantly occupied.



(C. International Newsreel Photo)

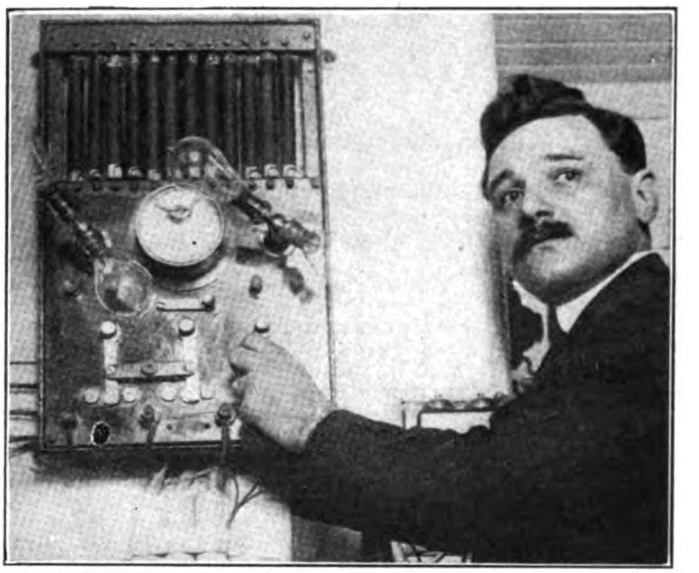
A model of the Radio Corporation's high power transatlantic radio station at Rocky Point, Long Island. The model is built on the scale of one inch to 100 feet, and shows the lofty antennae towers, power house and an exact replica of the landscape, even to the trees. The model will be exhibited at the Gothenberg Tercentenary Exposition in Sweden, and is to be used as a model for a station to be erected there.

Caption by Robert L Dougher

...len Box the Compass ...Rao Pictures

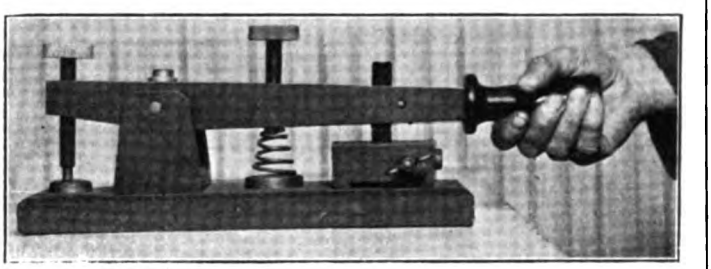
(C. International Newsreel)

Fellows, meet F. H. Schnell, traffic manager of the ARRL Eastern District! The league has just launched a plan to record interference of all kinds on broadcast waves between 360 and 400 meters every evening from 7 to 10:30 and will have the co-operation of 300 of the best known amateurs who will act as observers and file their reports. If your transmitter isn't "kickin' right" on 200, you'd better watch out, or F. H. will get his Wouff Houng out and chase you around the block.



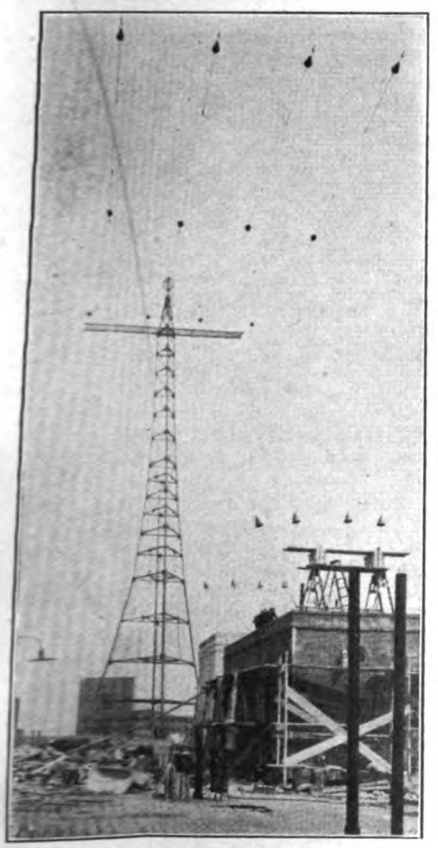
(C. Photonews)

Emergency panel on board the S. S. "Rochambeau" which supplies the set from storage cells in case of accident to the regular ship current which normally operates the set.



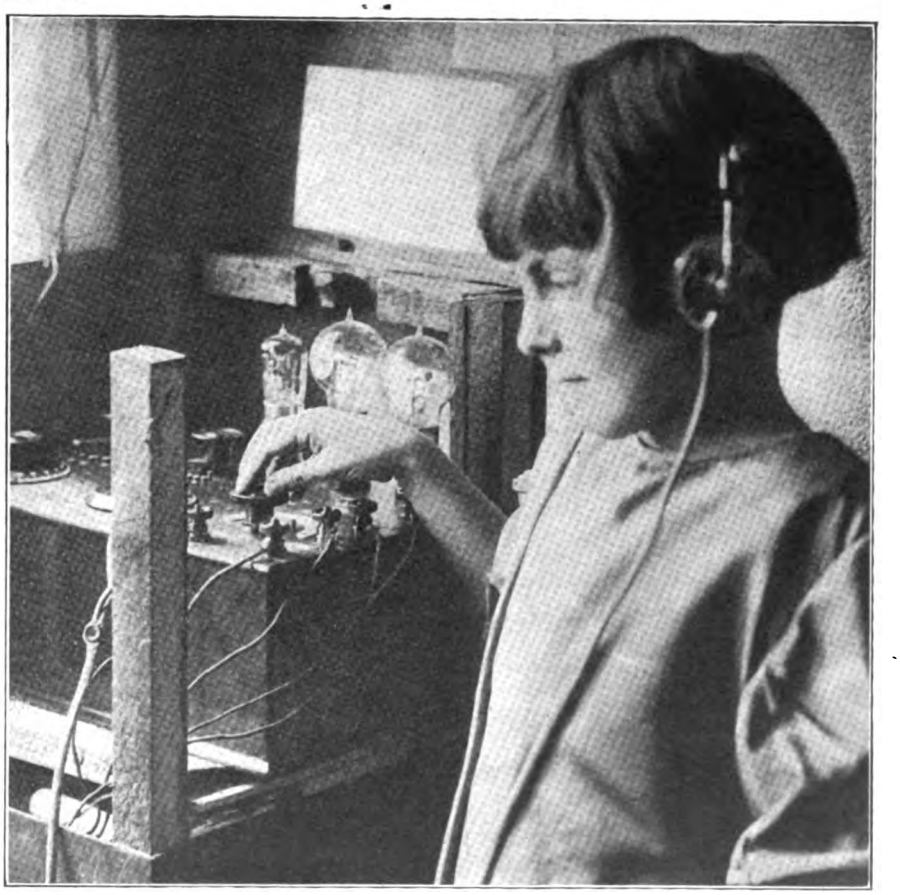
(C. Photonews, N. Y.)

This funny looking key once was the latest thing in the field of wireless. It is one of the old time pump keys and had to be worked in the manner shown. How different from the little arc-proof key of today which handles all kinds of current without sticking!



(Radio Corporation of America)

The completed antenna system at Aeolian Hall, New York. Two separate groups of wires will be used in connection with two transmitters making possible simultaneous transmission on two different wave lengths.



(C. Underwood and Underwood)

Little Miss Sheila Caulfield, of London, England, whose life was saved after a serious operation because her father told her that "Uncle Arthur," of the London broadcasting station, wanted to talk to her over the radio. The doctors attribute her marvellous fight for life to her desire to hear "Uncle Arthur" talk to her on her own radio set.

Answers to Readers

1. *Should the condensers in the article published by C. White in* RADIO WORLD *for March 24, 1923, be .25 mfd. or should they be .00025 mfd.?*

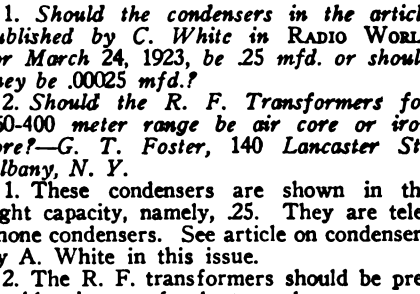
2. Should the R. F. Transformers for 360-400 meter range be air core or iron core?—G. T. Foster, 140 Lancaster St., Albany, N. Y.

1. These condensers are shown in the right capacity, namely, .25. They are telephone condensers. See article on condensers by A. White in this issue.

2. The R. F. transformers should be preferably air core for best results.

* * *

Is there any manner in which a crystal detector can be used with a variometer and variable condenser? — Malcolm Douglas, Webb, Okla.



Hook-up requested by Malcolm Douglas, Webb City, Okla., using a coupler, variometer and crystal detector.

You can incorporate the appartus you mention in the hook-up given herewith.

* * *

1. *Does the Western Electric Co. make a five watt power or transmitting tube?*

2. In hook-ups where they specify a .0005 variable condenser, can I use a .001?

3. Can the Western Electric 216 A tube be used in power amplifiers and what plate voltage can be used on them?—A. Gilburg, 1319 N. Chestnut Street, Spokane, Wash.

1.-3. There is a tube called the 216 A, manufactured by the Western Electric Co. that can be used as a 5 watt tube, and this tube is also the one used on the power amplifiers. When used as a power amplifier tube, 60 to 90 volts is used on the plate.

2. Where a .0005 variable condenser is specified, you can use a .001, but you will obtain finer tuning by the use of the smaller condenser.

* * *

1. *Would it be necessary for two amateurs living in the country to have licenses for operating transmitters made out of two Ford coils, the sets to be used solely for the purpose of learning the code? We live a mile apart.*

2. What apparatus would be necessary for this purpose?

3. Is there a flow of current from the B battery when the filament is extinguished?

4. What is the advantage of the honeycomb coil sets over the variocoupler variometer type?

5. Where are stations 9YS and 5XZ located?—Kenneth H. Jones, London Mills, Illinois.

1. It is necessary to have a license wherever signals are transmitted, no matter what apparatus is used.

2. The apparatus necessary will be a battery, or other source of current, key, Ford or spark coil, helix or tuner, condenser.

3. There is no flow of current when the filament is turned off.

4. The advantage of the honeycomb coil sets over the variometer type is flexibility, as the wave range is not limited to a comparatively small band, but may be varied at the listener's will from 150 to 25,000 meters.

5. Station 5XZ is listed as St. Charles College, Grand Coteau, La. Station 9YS is listed as Wesleyan University, Illinois.

* * *

1. *Can Cunningham 301A tubes be used in reflex circuits as shown by Mr. Thompson in your magazine?*

2. Can jacks be employed to cut out tubes in case reception is too loud?

3. Can the 400 ohm and 2,000 ohm resistances be purchased on the market?

4. What make of radio-frequency transformers would you recommend?—Thomas McLaren, Jr., 129 Pearl Street, Boston, Mass.

1. These tubes can be used as the amplifiers, but where a tube is used as a detector it is best to use a soft tube.

2. No. In order to accomplish this you would have to use an automatic switching system, because the detector must always be the last tube, and every circuit would have to be changed if you intended using fewer tubes.

3. These resistances can be purchased.

4. We do not recommend competitive makes of apparatus through these columns, but buy the best you can and be sure of your results.

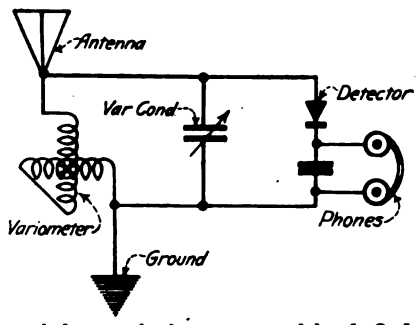
* * *

I want a hook-up for two WD-11 tubes which will bring in the distance stations. What parts are necessary for this set?—Jack D. Leseman, Charleston, S. C.

We refer you to RADIO WORLD for January 27 where you will find the information you desire on page 5 under the heading "How to make a two tube DX set" by John Kent. This also contains a list of the necessary parts.

* * *

Kindly furnish me with a hook-up for the following apparatus: One variocoupler, one variometer, two variable condensers, crystal detector, phone condenser, phones.—John O. Lee, Box 573, care of PSC, Davenport, Ia.



Crystal detector hook-up requested by J. O. Lee using a variometer as a tuner.

The hook-up you request is published herewith. Two condensers are not necessary.

* * *

What type of tube should be used for the Flewelling circuit? Can a Cunningham 301A be used? What plate voltage is necessary?—B. Maxwell Cox, Stafford Springs, Conn., Box 785.

A hard tube should be used for this circuit, such as the 201, or the 216A, or 301A as you suggest. The plate voltage should be 45 to 90 volts.

Radio Corporation of America Has Good Year

THE Radio Corporation of America, in its annual report for 1922, issued for publication last week, reveals the stupendous strides taken during the year toward the development of its vast system of world-wide wireless, outlines its comprehensive program for expansion in all parts of the world, and points out that the public interest in wireless, as shown by the demand for broadcasting, has been almost limitless. The report shows that America leads the world in radio.

To meet the great, popular demand for instruments for reception of broadcast programs the sales department of the Radio Corporation expanded from about fourteen persons to 200, and about 15,000 dealers now handle RCA products. The gross sales for the year were $14,409,557, including the high-power station to the Swedish Government, and seven medium-powered vacuum tube telegraph transmitters for use by the Tropical Radio Telegraph Company in this country, Guatemala, Honduras, Nicaragua, Costa Rica and Panama.

In addition to the increased enthusiasm and efficiency among the personnel of the company there were three outstanding events on the human side of the operation of the Radio Corporation. One was the visit of Senator Marconi, inventor of the first system of wireless communication, as the guest of the corporation; a second was the creation of the new office of Managing Director of International Relations, to which office Mr. Edward J. Nally was elected, and the third was the taking of Mr. Nally's place as President by Major General James G. Harbord, Deputy Chief of Staff of the United States Army, and noted overseas commander and organizer. In the financial section the report says:

"The corporation's financial position has been further strengthened during 1922. Current assets have increased $3,775,984, and exceed the current liabilities by $5,997,966. The current liabilities, amounting to $2,688,941, represent indebtedness for merchandise, materials, and federal income tax. The corporation has no bonded debt.

"The total of plant and equipment, $12,711,348, remains substantially the same as last year, while the reserve for depreciation and obsolescence of plant has been increased by $529,376, and now amounts to $1,347,705. The amortization of patents reserve, after charging patents expired, now stands at $2,405,376, and represents the depreciation to December 31, 1922, indicated by the schedule founded on the life of such patents.

"After providing for depreciation of plant and inventory the operations for the year resulted in a net profit of $2,974,579, which has been allocated, in the main, to reserves for patents and federal income tax, the balance having been applied against organization expense.

"The profits were not sufficient up to December 31, 1921, to meet patent amortization called for by the schedule, and it was necessary to charge $1,666,284 against common stock equity. The total of $2,480,576, transferred from 1922 earnings, provides for 1922 patent amortization and the restoration of the above amount to common stock equity.

"The corporation's capital stock consists of 3,955,974 shares of 7 per cent. preferred stock of $5 par value and 5,734,000 shares of common stock of no par value, against which latter there is shown on the balance sheet an equity of $13,660,163, which is approximately $2.38 a share. No dividend was paid during the year 1922 on either the preferred or the common stock. The 7 per cent. preferred stock becomes cumulative January 1, 1924."

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The DX Nite Owls

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

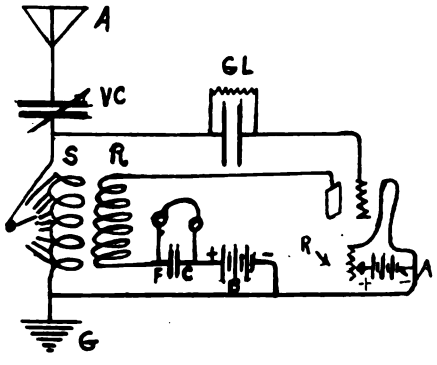
Some DX Dope from the Navy

From C. R. Spicer, U. S. Naval Radio Station, Pt. Loma, San Diego, Calif.

AM enclosing you a hook-up of a set I have been using for a long time and also a little data along with it.

Hook-up is single circuit, but it does the work and gets the results and that in my estimation is what counts. Instruments necessary are as follows:

1 Variocoupler (Rewind Rotor and Stator if necessary).
1 Variable Condenser, 23-plate, .0005.
1 Grid Leak, 3 Megohms.
1 Grid Condenser, .00025.
1 Fixed or By-Pass Phone Condenser.
1 Tube, Socket and Filament Rheostat.



C. R. Spicer's hook-up. He is in favor of rewinding the variocoupler, as described below.

"A" and "B" batteries and pair of good phones.

Get best results with 40 volts on "B" battery.

Am using at present an antenna 150 feet High and 175 long, single wire, but this length and height is unnecessary.

With this hook-up I have received the following stations from the Naval Radio Station here at Pt. Loma, San Diego, Cal.: KDKA, WGY, WOC, WSB, WMC, WWJ, WOR. (During special test with KHJ) WHB, WDAP, WBAF, WFAA, KYW, KSD and others. This list not including Pacific Coast Stations for they are too numerous. Stations mentioned of course do not tear the shack down when they open up, but comfortable reading is assured.

A word about the variocoupler. The Primary tubing is 5 inches in diameter with 60 turns 22 DCC were tapped every 6 turns. The rotor is 4 inches in diameter around with 40 turns of 22 DCC.

Although being within reach of some mighty fine apparatus I have not used any navy instruments.

* * *

Seventy-five Isn't Half Bad as a Beginning!

From Guy Esmond, 13 Grotto Court, Watervliet, N. Y.

I am a subscriber for your magazine, and, wishing to join your Nite Owls am sending what I think is a pretty good record for a one tube set with coupler and condenser:

WNJ, Albany; WSY, Alabama; WOK, Arkansas; WNAC, Boston; WGR, Buffalo; WDAP, Chicago; KYW, Chicago; WMAQ, Chicago; PWX, Havana; WDAK, Connecticut; WDAP, Chicago; WNAJ, Chicago; WDAJ, Georgia; WGM, Georgia; WSB, Georgia; WLK, Indiana; WOC, Iowa; WDAX, Iowa; WKAA, Iowa; WJAF, Indiana; WHAS, Kentucky; WDAD, Kansas; WHAN, Kansas; WEAD, Kansas; WDAF, Missouri; WLAP, Kentucky; WMAK, Lockport; WWI, Michigan; WHAH, Missouri; WIAP, Mass.; WMAF, Mass.; WGI, Mass.; WWJ, Mich.; KOP, Mich.; KSD, Mich.; WMAT, Minn.; WMAJ, Missouri; WMB, Maine; WBZ, Mass.; WLAQ, Mich.; WBAD, Minn.; WEAA, Mich.; WLB, Minn.; WFAQ, Missouri; WCX, Mich.; WHB, Missouri; WEAF, N. Y. C.; WJZ, New Jersey; WOR, New Jersey; WBT, North Carolina; WMAC, N. Y.; WMAH, Nebraska; WHAM, Rochester, N. Y.; WVP, N. Y. (Bedloes Island); WAAM, New Jersey; WLAD, Nebraska; WRW, Tarrytown, N. Y.; WJAX, Ohio; WLW, Ohio; WLAL, Oklahoma; WWB, Ohio; WEAO, Ohio; KDKA, Pittsburgh; WFI, Philadelphia; WIP, Philadelphia; WCAU, Philadelphia; WCAE, Pittsburgh; WOO, Philadelphia; WQAA, Parkersburg, Pa.; KQV, Pittsburgh; WDAR, Philadelphia; WEAN, Providence, R. I.; WGAM, S. Carolina; WGY, Schenectady, N. Y.; WRL, Schenectady, N. Y.; WHAZ, Troy, N. Y.; WDAA, Tenn.; WMZ, Tenn.; WCM, Austin, Texas; WDAG, Amarillo, Texas; WHAJ, W. Virginia; WEAE, Virginia; WIAO, Wisconsin; WHA, Wisconsin. I have been working my set for five months and have heard these stations quite a few times.

* * *

Hitting Them on "The Fairway"

From C. Cutbell, 112 Chatterton Parkway, White Plains, N. Y.

THE enclosed "Radio Golf Score" record was made by me on the evening of Feb. 22, 1923. I am using an "Aerola Sr." with one-step of A. F. amplification, and I think this one "beats 'em all." As can be seen I average 6,000-8,000 miles per night.

Time, First Half, 7:30-8:30—7:30, WJZ, Newark, N. J., 50 miles; 7:35, WEAB, New York, N. Y., 35; 7:40, WMAB, Round Hill, Mass., 200; 7:50, WLAB, Carrollton, Mo., 1,075; 7:55, WPO, Memphis, Tenn.,* 1,000; 8:00, WOR, Newark, N. J., 50; 8:05, WHAZ, Troy, N. Y., 200; 8:10, WWJ, Detroit, Mich., 600; 8:12, KDKA, Pittsburgh, Pa., 375; 8:15, WQY, Schenectady, N. Y., 175; 8:17, WBZ, Springfield, Mass., 175; 8:20, WCAE, Pittsburgh, Pa., 375; 8:25, WEAN, Providence, R. I., 150; 8:30, KYW, Chicago, Ill., 800 miles.

One-half hour intermission.

Time of Second Half, 9:00 to 10:30—9:00, KSD, St. Louis, Mo.,* 1,100 miles; 9:07, WOC, Davenport, Iowa, 1,100; 9:15, WSB, Atlanta, Ga., 800; 9:20, WOAP, Chicago, Ill., 800; 9:25, WJAX, Cleveland, O., 600; 9:30, WHAS, Louisville, Ky., 700; 9:40, WJAR, Providence, R. I., 160; 9:45, WKB, Kansas City, Kansas.,* 1,250; 9:50, WLW, Cincinnati, Ohio, 625; 9:55, WGI, Medford Hillside, Mass., 250; 10:00, WNAC, Boston, Mass., 200; 10:05, CFCA, Toronto, Canada. 600; 10:15, WIP, Philadelphia, Pa., 125; 10:20, WGM, Atlanta, Ga., 800; 10:25, PWX, Havana, Cuba.,* 900 miles.

*Stations heard first time.

MAGNAVOX Pioneers in the Radio Field

IT was in 1913 that the Magnavox electro-dynamic receiver made its first public demonstration, when telephone communication was held between Denver and New York—a revolutionary advance.

The rise of radio broadcasting found Magnavox apparatus already perfected and in successful use.

R 2 Magnavox Radio with 18-inch horn

THIS instrument is intended for those who wish the utmost in amplifying power: for large audiences, dance halls, etc., but requires only .6 of an ampere for the field.

Price, $60.00

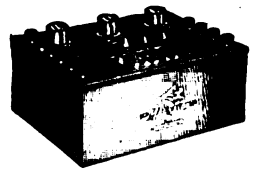
R 3 Magnavox Radio with 14-inch horn

SAME in principle and construction throughout as Type R-2.

Is ideal for use in homes, offices, amateur stations, etc.

Requires one ampere field current from your filament battery.

Price, $35.00



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CAN be used with any "B" Battery voltage which the power tube may require for best amplification.

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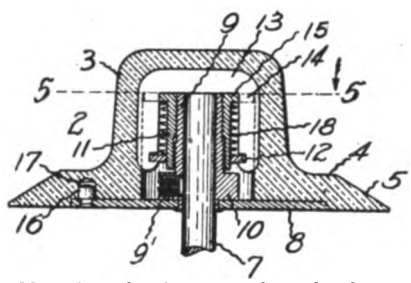
Latest Radio Patents

Actuator for Electric Appliances

No. 1,446,652: Patented Feb. 27, 1923. Patentee: Shiras Morris, Hartford, Conn.

THIS invention relates to what might be broadly termed an actuator for an electric appliance, such as is utilized in wireless work. Such an appliance that is in common use involves a spindle, which is turned by an actuator or dial.

There is in every-day use a wireless cabinet equipped with a spindle with which is associated a knob. This knob in the old structure is attached to its spindle by a binding screw, which is exceedingly objectionable in that it left a metal part exposed. It has been essayed to cover the knob by a cap, which is usually of the same composition as that of the knob, the two parts being usually detachably associated by interengaging threads so as to present what might be considered a duplex cap or dial for a spindle. I provide an actuator or dial for a spindle in one piece from suitable composition, and its exterior has no objectionable projections, yet, by virtue of the invention, when such an actuator is connected with a spindle the latter can be rotated readily



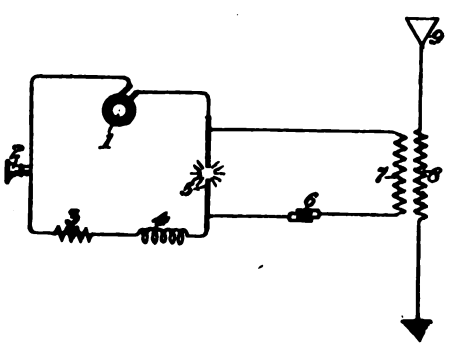
Morris' insulated actuator for radio electric appliances.

when desired—for instance, in tuning—and it also may be quickly taken from the spindle.

System of Ether Wave Control

No. 1,447,779: Patented March 6, 1923. Patentee: John Hays Hammond, Jr., Gloucester, Mass.

Some of the objects of this invention are to provide an improved transmitting station



Diagrammatic representation of John Hayes Hammond, Jr.'s, system of ether wave control.

for radiant energy; to provide an improved receiving station for radiant energy; to provide a transmitting station, including means for continuously emitting electro-radiant waves of constant amplitude at high frequency, and a device for increasing the amplitude of certain of said waves at will in response to and in accordance with sound waves in combination with a receiving station, including a telephonic receiver responsive to said waves of increased amplitude, and a signaling device unresponsive to said waves of constant amplitude, but responsive to said waves of increased amplitude; and to provide other improvements.

Plural Modulation and Demodulation Circuits

No. 1,447,284: Patented March 6, 1923. Patentee: Lloyd Espenschied, Queens, N. Y.

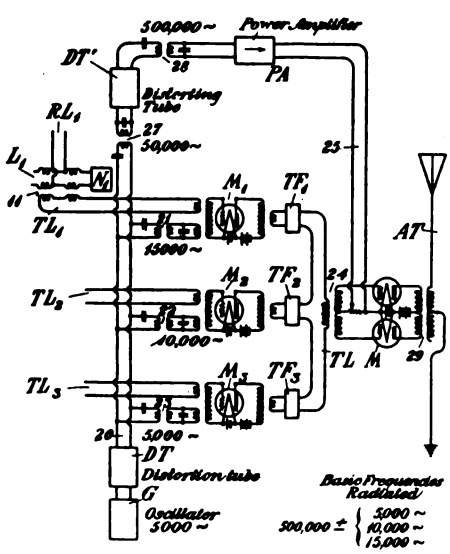
This invention relates to the transmission of signals and more particularly to systems for the multiplex transmission of radio signals.

One of the features of the invention resides in improved methods and means for securing selectivity between a plurality of signaling channels.

Another feature of the invention relates to methods and means whereby the interval between successive signaling channels may be reduced to a minimum.

Still another feature of the invention has reference to the provision of means and methods whereby the frequency intervals between signaling channels may be fixed or determined either at the transmitting station or receiving station, or both.

These features, together with other features of the invention more fully hereinafter appearing, are realized in a method of operation whereby multiplex channels are collected at the sending station and separated at the receiving station at frequencies which are low, compared with the frequencies used in actual transmission between stations. The essential principle underlying this method is that of a frequency step up and a frequency



Illustrating Espenschied's plural modulation and demodulation circuit invention.

step down of a plurality of channels in common, in accordance with addition and subtraction of frequencies by modulation.

A Two-Way Conversation Over 2,000 Miles

By Jeffrey J. Dingman

CFCN, the radio broadcasting station of the W. W. Grant Radio Ltd., at Calgary, Alberta, Canada, which recently accomplished the remarkable feat of conducting a continuous two-way conversation 2,000 miles overland with WHAZ, Troy, New York has a modulating output power of 2,000 watts. When the record breaking conversation with Troy was held Mr. Grant was operating under difficulties and on only 1,000 watts output, and with a generator which has just undergone repairs and was working at only 75 per cent of the full power.

Operation of the rejuvenated set, now one of the most powerful on the continent, was delayed by a devastating fire which destroyed the plant of the W. W. Grant Radio Ltd. CFCN, however, is now equipped with four 500 watt tubes, which were especially manufactured in Montreal, as well as with a specially designed amplification system carrying two 50 watt tubes. A new generator has also been installed and the power of the station has been multiplied four times.

Peculiarly enough, in spite of the vision which might arise in the reader's mind, CFCN is no pretentious establishment. It is a little shack situated on Crescent Heights, in the north end of the city of Calgary, and at a high elevation. Prominent radio engineers from all over the continent who have visited the station here have been amazed to find lacking that which they anticipated, a monumental establishment, with ornate reception rooms and rooms for the talented artists who nightly provide the entertainment for radio enthusiasts the continent over.

The receiving set used to pick up signals from WHAZ, the broadcasting station of the Rensselaer Polytechnic Institute at Troy, on the night of January 12 last when the feat was accomplished, is a Grant-Northern Electric, four tube set, with two stages of radio frequency, one detector and one audio frequency tube. The writer was at the station on the morning of January 13 and could easily hear WHAZ with the headphones held more than two feet away. Hundreds of Calgary and Alberta radio enthusiasts advised CFCN by long distance telephone that they had picked up snatches of the broadcast from WHAZ, while of course they heard the CFCN broadcast in its entirety.

Hundreds of letters poured into the station following the record breaking conversation, one coming from a resident of the Bronx, New York City, who heard Mr. Grant and the Rensselaer Tech both on the night of the record breaking talk. Another came from Alaska, while the majority were from the provinces of Canada and the Western United States.

Achievement of this feat marked an epoch in radiophone broadcasting and established a record for Canada and the United States. If this could be done while CFCN was operating under difficulties and on half of its present output, it is considered that much more marvellous achievements can be attained. At the present time Mr. Grant is negotiating with several far distant stations with a view to arranging a test which will shatter his own record.

W. W. Grant was former chief of the radiophone station of the Canadian government at High River, Alberta, and served with distinction in the European war, having acquired several patents for inventions tending to improve radiophone receiving apparatus, which were utilized to advantage on the battlefields of France. At present he is also operating CHBC, The Morning Albertan station at Calgary.

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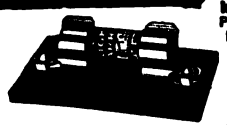
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Makers of Teleradio Supersensitive Phones

Solution for Broadcasting Difficulties Offered

AN advanced step to eliminate interference between broadcasting stations was taken when the "power-staggered-wave-length-broadcasting plan" was presented by the National Radio Chamber of Commerce to the Hoover conference last week in Washington.

The National Radio Chamber of Commerce has been studying the broadcasting situation for over a year. At the public hearing the power plan was recommended almost in its original entirety, being one of the most constructive suggestions submitted, and meeting with general approval.

Briefly, the "power-staggered-wave-length-broadcasting plan" contemplates the use of three major bands of wave lengths. Broadcasting would be divided into three main divisions, according to the type of program furnished. Programs covering lectures, talks, reports, etc., would be broadcast on a particular wave length band. Classical musical programs would be broadcast on another wave length band, while popular musical programs would be confined to still another wave length.

In addition, the country would be divided into broadcasting districts. Broadcasting stations would operate simultaneously on the three major wave length bands. The plan has been so worked out that there is ample variation in wave lengths, and no two broadcasters will interfere with each other. In fact, three broadcasters may operate simultaneously in one district without interference, as well as several other broadcasters, in accordance with the time schedule arrangements. The idea back of the whole plan is to give the public what they want when they want it. The receiving sets are tuned to the program desired.

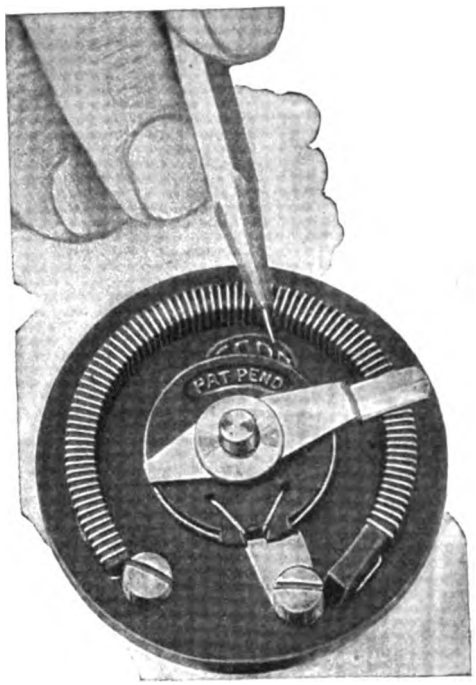
The power plan as recommended by the National Radio Chamber of Commerce was originated by Harold J. Power, of Medford Hillside, Mass. Mr. Power is vice-president of the American Radio and Research Corporation. He was a pioneer in the development of radio, and has devoted much of his time to study of the broadcasting situation, being an active member of the special Broadcasting Committee of the National Radio Chamber of Commerce.

WDAP Proves Its Power in Unusual Way

RADIO history was made recently through the efforts of Thorne Donnelley and Elliot Jenkins, in charge of broadcasting at Station WDAP, Drake Hotel, Chicago. While the letters WDAP are merely a designation by the government for this station alone, they have been most appropriately interpreted as meaning "We Do Atlantic-Pacific" in view of the extremely wide range of "pick up" from this powerful inland station, which has been designated as the official broadcasting station of the Chicago Board of Trade.

On the S. S. "Berengaria," clearing 600 miles a day, which sailed from New York January 30th, Miss Florence McDonald had installed a receiving set. From January 30th to February 4th, every day at appointed hours, messages were flashed vocally by Mr. Donnelley, heard and recognized aboard the "Berengaria."

Each time an erroneous statement regarding the length of the Berengaria would be made (newspaper men picked the number haphazard out of a hat a few minutes before the broadcasting) and each time came back the answer from the steamship giving the incorrect length as well as the correct length, now 250 miles out, then 725 miles out, again 1286 miles out, again 1824 miles and so on until the maximum distance was reached. This was the first successful attempt to reach a voyaging ship from an inland station, on a predetermined schedule. No special tubes were used by the Drake station nor in the receiving set.



Fada Rheostats and Potentiometers

Over a million and a half FADA receiving tube rheostats alone were manufactured during 1922.

FADA vernier rheostats and potentiometers are fast becoming the favorite with the radiophans who construct their own receivers.

120-A	Rheostat (5 ohm)...	$0.75
121-A	Power Rheostat (1½ ohm)	1.20
150-A	Vernier Rheostat (5 ohm)	1.25
151-A	Vernier Attachment.	.50
152-A	Potentiometer (200 ohm)	1.00
153-A	Rheostat (8 ohm)...	1.00
154-A	Potentiometer (400 ohm)	1.00
159-A	Vernier Rheostat (8 ohm)	1.50

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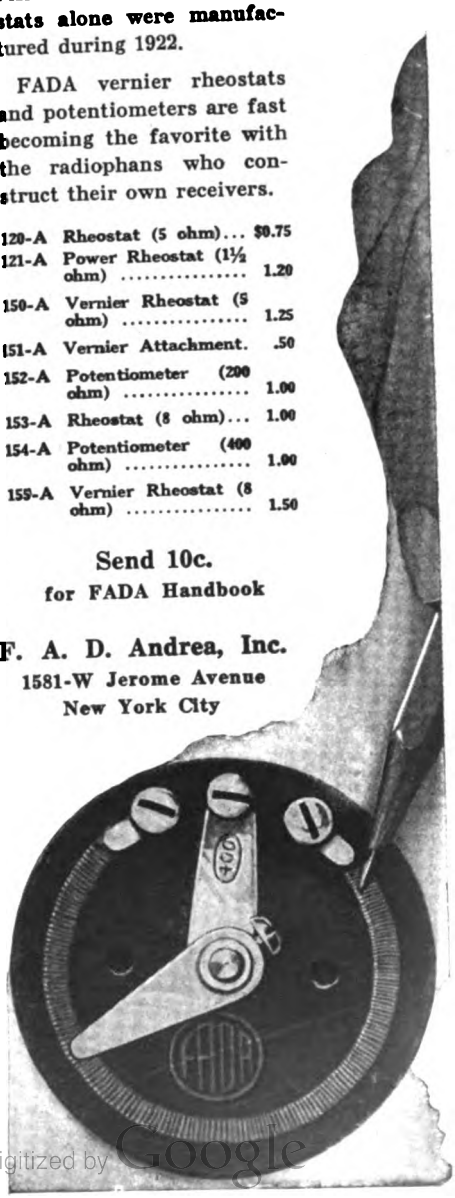
1581-W Jerome Avenue
New York City



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Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796.

New Radio and Electric Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

Newburgh Radio Shop, Newburgh, N. Y. W. C. Olsen, 30 East 42nd St., New York City, attorney.

Market Street Radio Supply Co., 306 Market St., Philadelphia, Pa.

New York Radio Co., 302 Market St., Philadelphia, Pa. Hart & Myerson, proprietors.

The Radioelectric Co., 5630 North Fifth St., Philadelphia, Pa.

The Radio Shop, San Antonio, Tex., has moved to 407 Main St.

Kenneth Paton, Cashmere, Wash. Adding radio department.

Radio Auto Light Corp., Wilmington, Del., electrical devices, $300,000. (Corporation Service Co.)

Philadelphia Radio Co., Philadelphia, Pa., radiophones, $100,000. (Corporation Guarantee & Trust Co.)

Williamsburg Radio Supply Co., Brooklyn, N. Y. $10,000; I. B. Suchar, B. Firstenberg. (Attorney, A. J. Suchar, 801 Flushing Ave., Brooklyn.)

Sterling Electric Corp., New York City, $150,000; A. W. Palmer, V. A. Roberts, G. M. Hesller. (Attorney, Morrell, Bates, Topping & Anderson, 27 Cedar St.)

Chicago Telephone Supply Co., Elkhart, Ind., increase from $150,000 to $300,000.

DeForest Phonofilms, New York City, $50,000; H. Bogdish, A. Powsner, H. A. Deimel. (Attorneys, Fisher & Deimel, 129 West 42d St.)

Brilliant One Radio Products, New York City, $25,000; S. S. Goldstein, G. Mitchell, N. Krauss. (Attorney, S. Rosenberg, 309 Broadway.)

A certificate of incorporation for the Imperial Radio Corporation has been filed in Jersey City, N. J. The capital stock is $500,000, of which $2,000 is paid in. The incorporators are: E. Russell Carlile, William Adelson and R. E. Albin of 37 Madsion Avenue, New York; C. E. Gault of Montreal, Canada; Edwin S. Gleason of Roseville, S. I., and Adolph Berliner, 116 Nassau Street, New York.

Universal Electric Stage Lighting Co., New York City, $400,000; A. T. and J. H. and L. Kliegel. (Attorney, Dittenhoefer & Fishel, 1,482 Broadway.)

The Suneco Tube Adapter

A DEVICE which permits the elimination of storage batteries and rewiring and permits the use of the WD-11 tube is provided in the Suneco tube adapter. The new model is known as Type A-D 112, has no soldered connections, and is made of the best grade moulded condensite. It will adapt the aeriotron WD-11 tube to any standard socket without the necessity of rewiring. It also allows the tube a half-inch clearance, tending to avoid breakage and permitting the use of the tube in a greater number of sets.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested through the Service Editor of RADIO WORLD by the following:

J. A. Powie, 1431 Clifton Street, Washington, D. C.

W. C. Otis, 48 Nashua Street, Woburn, Mass.

S. Forbes, Box 1431, Boston-2, Mass.

L. A. Knopping, 230 River Road, Bogota, N. J.

W. V. Kershow, 114 W. Kennedy St., Syracuse, N. Y.

Radio Research Guild, 9-15 Clinton St., Newark, N. J.

Alfred Wagstaff, Jr., 2 East 55th St., New York City.

J. E. Shermer, 5720 Knox St., Philadelphia, Pa.

H. W. Levy, 1090 St. Nicholas Ave., New York City.

A. C. Penman, 2333 Creston Ave., New York City.

Robert Ervien, 207 South 52d St., Philadelphia, Pa.

Radio Stocks

(Quotations as of April 4, 1923, Furnished by Frank T. Stanton & Company, 35 Broad Street, New York City.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	15*
American Marconi, Unstamped	$5	$7
American Tel. & Tel.....	121½	122
Canadian Marconi	2½	3
De Forest Radio.....	8	10
Dubilier Condenser	10	11
English Marconi com.....	12	16
English Marconi pfd.....	12½	16½
Federal Tel., Cal.....	5	6
General Electric	179½	180
Hennessy Radio Pub. 8% pfd.	9	11
Mackay Companies com.....	113	116
Manhattan Elec. Supply.....	56	57
Marconi Int. Marine.....	8	10
Radio Corporation com.....	4	4¼
Radio Corporation pfd.....	3⅜	3½
Spanish Marconi	1	3
Western Union	110½	110¾
Westinghouse E. & M.....	64½	65

*Cents per share.

Preliminary Injunction Denied in Radio Patent Action

Federal Judge Rellstab at Newark, N. J., has denied an application for a preliminary injunction made by the Westinghouse Electric and Manufacturing Company against the Radio Craft Company, Inc., and the De Forest Radio Telephone and Telephone Company, both of Jersey City. The Westinghouse company alleged that the two companies had infringed upon certain radio patent rights owned by it. The court fixed May 8 as the date for hearing a motion for permanent injunction and directed the defendants to to file a joint bond of $10,000 to indemnify the plaintiff company against loss through patent infringement.

Brooklyn Radio Exposition

RADIO EXHIBITORS OF BROOKLYN, general exposition of radio apparatus and accessories. Signal Corps Armory, Dean St. and Washington Ave., Brooklyn, N. Y., April 23 to April 28, inclusive.

Where the General Radio Company Makes and Tests Its Products

Testing laboratory (left) and general view of machine shop (right) of the General Radio Company, Cambridge 39, Mass.

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Phillips
SPORT 123 NASSAU SHOP

Est. 1895 Cort. 1550

PARTS FOR COMPLETE

TUBE SET

$12.45

Parts to make up this Complete Outfit include 1½ Volt Tube—Fischer Variocoupler with 14 taps—4 steps—23-Plate Variable Condenser—2 Knobs and Dials—Rheostat—Socket—Grid Leak Condenser—Dry Cell—22½ Volt Plate Battery—6 Binding Posts—7x12 Panel. Drilling Panel $1.00 extra.

Cabinet for above set, $2.45

Federal Phones, 2000 ohms	$4.95
Rico Phones, 3000 ohms	4.00
Diamond Phones	3.29
Baldwin Phones, New Type "C"	8.25
Murdock Special, 3000 ohms	4.50
Arrow 23 Plate Ver. Condenser	3.95
Arrow 43 Plate Ver. Condenser	4.50
Hungerford Imp. Outdoor Lightning Arrester	1.75
Hungerford Indoor Arrester	1.10
Brandes Superior Phones	5.95
180° Fischer Variocoupler	2.00
Fischer Variometer	1.80
Acme Transformers	3.45
Thordarson High Ratio Trans.	3.75
W. D. 12 Transformer	3.75
Acme—Type A2S—Audio Transformer	3.75
1½-VOLT TUBE GUARANTEED	4.50

EVERYTHING GUARANTEED OR MONEY BACK

Mail Orders Filled the Same Day Money Order, Including Postage

123 NASSAU STREET
NEW YORK CITY

FREE VOLTMETER or AMMETER With Every $5.00 Purchase

A Money-Back Guarantee Goes With Everything We Sell

WE SELL ONLY STANDARD PARTS AT LOWEST PRICES

Kiesser Vernier Rheostat	$0.70
Atwater-Kent Variometers	6.75
Atwater-Kent Variocouplers	6.75
Raven Molded Variometer	4.00
Westinghouse Dry Cell Tube	5.50
French Detector Tubes	4.00
French Amplifying Tubes	4.50
A. B. C. 23 Pl. Condenser	1.90
A. B. C. 43 Pl. Condenser	2.30
A. B. C. 23 Pl. Vernier Condenser	3.75
A. B. C. 43 Pl. Vernier Condenser	4.00
Original Baldwin Type C Phones (double)	8.75
Baldwin Type C (single)	4.50
Stromberg-Carlson Phones	6.00
Federal Phones	5.00
Bradleystats	1.70
150-3000 Meter Silk Wound 3 Bank Wound Coil	3.50
Woodhead Loud Speaker	5.50
King 600 Meter Variometer	3.00
N & K 6000 Ohm Phones	6.50

Complete Stock. Write for Prices

Send Money Order or Certified Check and include Postage.

GLOBE RADIO SHOP

115 West 23rd Street New York

12000-OHM List Price 75c.

RESISTANCES IN STOCK

For the New Super Circuits

RADIO STORES CORPORATION

DISTRIBUTORS

220 W. 54th St., N. Y. City Longacre 10110-0210

Radio Exports in January

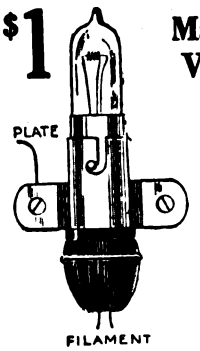
AMERICAN radio exports in January fell off slightly over those of December. The exact figures were: January, $141,577 against December, $163,236. During January, the last month for which figures are available, most of these exports went to Canada although large shipments of apparatus went to Australia and Cuba.

Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

$1



Margo Detector Vacuum Tube

Operates on one dry cell with or without "B" battery. If your dealer has not stocked them send direct, adding 25c for socket and 5c for postage.

Margo Detector Co.

66 Boylon Street
Newark, N. J.

Radio Perfection

BESTONE

Spring Grip Telephone Plug

The Bestone Plug is an entirely radical departure in design and construction, giving superior results.

A simple pressure of the buttons instantly connects or disconnects the receivers. It is not necessary to disassemble the Bestone Spring Grip Plug for any reason. Just insert the cord tips—no more work, worry, or possibility of a poor connection.

Eliminates the use of several plugs—enables you to use from one to three sets of telephone receivers, or to change from head phones to loud speaker, without disconnecting. List.... **$1.25**

is attained only by the use of mechanically and scientifically perfect parts.

Now, more than ever, when the market is flooded with inferior goods, one cannot be too careful in the selection of standard, trade-marked articles, and in purchasing from a reliable source.

It is our aim to supply the highest standard radio specialties, thus insuring perfect results and satisfaction.

Every article we sell is unconditionally guaranteed both by the manufacturer and this organization.

FREDERICK H. PRUDEN

Incorporated

993 Bergen Avenue
Jersey City, N. J.

ASK ANY "ALL WAVE" COUPLER USER. THEY ALL GET

DX STATIONS LOUD AND CLEAR

WITH THE GENUINE AND GUARANTEED

"ALL-WAVE"

(Trade Mark)

COUPLER

Patents Granted

And anyone of the Six Simple Super-Sensitive Single Circuit DX Hookups

GIVEN FREE

with each Genuine and Guaranteed "All-Wave" Coupler

It is an established fact that any one of the simple Capitol Single Circuit hookups used in conjunction with the Genuine and GUARANTEED "ALL WAVE" COUPLER will bring in "DX" stations louder and clearer than any double circuit can.

WAVELENGTH 150 to 3000 METERS
PRICE $9.00
effecting a real saving, inasmuch as ALL VARIOMETERS, VARIOCOUPLERS AND LOADING COILS ARE ELIMINATED

6 efficient hookups sent upon receipt of 10c. to cover cost of mailing

Capitol Phonolier Corporation 60 Lafayette St. New York

Rexite Synthetic Crystals

Sensitive over the entire surface.

Dealers—Write for unusual proposition.

THE AIREX COMPANY

218 Centre Street New York

The dials with absorption losses reduced to a Minimum

Specially designed cross-section insures minimum loss. Enamel, graduation and numbers are particularly clear. Knob so shaped that fingers do not interfere with easy, accurate reading.

Na-ald dials are moulded from genuine Na-ald material. Rheostat heat will not affect them. They run true; cannot warp.

3-INCH DIAL 35c

2-inch dial for rheostat potentiometer use, 50c; 3½" dial, 75c.

Send stamp for literature.

Alden Manufacturing Co.

Formerly Alden-Nasler Company

52 Willow St., Springfield, Mass.

Dept. L.

NA-ALD

Radio and the Coast Guard Save a Lightship Man

RADIO, a coast guard cutter, and a lifeboat launched through an unusually rough surf at night were instrumental last week in saving the life of John H. Steel, member of the crew of the Fenwick Island lightship, thirty miles off the southeast coast of Cape May, N. J. Early in the evening a message was received at the naval radio station at Cape May from the lightship stating that Steel had been stricken with acute appendicitis and that his life was in danger. The message was relayed to Captain R. C. Weightman, of the cutter Kickapoo, who immediately put out to the lightship in a sea running high. Steel was swung aboard and taken to the Delaware Breakwater, where Captain Lynch, of the Lewes coast guard station, notified in advance, called out the station crew and brought the lifeboat safely through. A waiting automobile took Steel to the government hospital at Lewes, where an operation was performed. Attending surgeons said later that Steel would recover.

PARTS PRICES SLAUGHTERED

CASH WITH ORDER
PARCEL POST PREPAID

$6.50 Guar. 1½ Volt Tubes (detector and amplifier) for dry cells	$4.50	$4.75 Phones, 2200 ohms, splendid receivers	$3.75
5.00 Detector Tubes, guar.	2.75	1.00 3-in. Hard Rubber Dial	.35
5.00 Amplifier Tubes	3.50	.60 V. T. Sockets	.40
1.75 3 Plate Variable Condenser	1.25	1.50 22½ V. Cyclone B. Batteries	.80
3.75 23 Plate Var. Cond. Molded Ends	1.40	1.75 22½ V. Cyclone B. Batteries	1.25
4.75 43 Plate Var. Cond. Molded Ends	2.75	4.75 Thordarson Amp. Transformer	3.75
1.00 Rheostat	.20	5.50 Acme Amp. Transformer	4.10
1.50 Kloesner Vernier Rheostat	1.10	3.75 Vario Couplers	1.75
5.00 W. D. 11 Transformer and for all dry cell tubes	4.50	7.00 All Wave Coupler, 3000 Meters	6.95
		5.00 Variometers	2.75

To avoid delays check items and total amount.

B. B. RADIO COMPANY

2202 MERMAID AVENUE Dept. W. BROOKLYN, N. Y.

All Deliveries Made Within Two Days

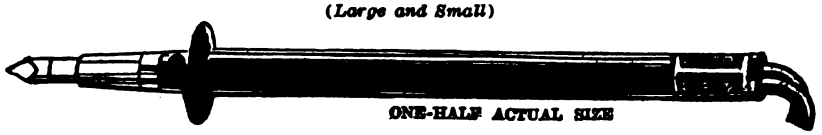
DELICATE SOLDERING

Both the manufacturers' and amateurs' problem on all fine work is readily solved by the instrument constructed for this particular purpose.

THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tips—Universal Current

(Large and Small)



ONE-HALF ACTUAL SIZE

$6.00

From Your Dealer or Write

Awarded Certificate of Excellency, N. Y. Evening Mail Radio Institute

POST ELECTRIC COMPANY, (Div. 509) 30 E. 42nd St., New York

SUNBEAM

First for Price, Quality and Service

All standard merchandise guaranteed.

This is one of the numerous testimonials to the service which we render.

Sunbeam Electric Co., New York City:—

12 Wave Ave., Wakefield, Mass.
Feb. 12, 1923.

Gentlemen:—Permit me to express my appreciation in the way my recent order was handled for a set of Berwick phones and Dictograph Speaker, both of which were highly satisfactory. . . . Again thanking you for the very prompt attention given my order and for the high grade material supplied, I am

Very truly,
(Signed) EDW. L. NUTE.

Dictograph Loud Speaker	$13.20	R. C. Transformers U.V. 712	$6.25
Dictograph Phones	5.75	R. C. Transformers U.V. 1714	5.75
Federal Phones	4.75	Baldwin Loud Speaker Unit	4.75
Federal Transformers 226 W	5.55	De Forest Triple Coil Mtg., Type L.C. 100	5.85
Federal Potentiometer	1.25	Radiant Condensers with geared Vernier—	
Cutler-Hammer Rheostats	.85	43 plate	6.00
Cutler-Hammer Ver. Rheostats	1.25	23 plate	5.00
Kloesner Vernier Rheostats	.79	Bakelite V.T. Socket	.49
Acme Transformers	4.25	Freshman Variable Grid Leak	.69
Ajax Socket-Rheostats	1.75	Firth Phone Plugs	.75
Sunbeam Long Wave Variocoupler, 150 to 3000 Meters, Complete with Solid Bakelite Variometer Mounted	$11.95	Coil Only 3 Layer, Bank Wound, Silk Wire (Hook-up Furnished with Coil)	$3.25

Select your set and write us for prices. We'll do the rest.

SUNBEAM ELECTRIC COMPANY

71 THIRD AVE. (Bet. 11th and 12th Sts.) NEW YORK

Farm Lighting Plants at Bargain Prices. For Yachts, Motor Boats and Country Homes.

Radio Station Heard 8,000 Miles

TO be heard 8,000 miles is the record of the radio broadcasting station erected by the International Western Electric Company at the Brazilian Centennial Exposition at Rio de Janeiro," said Col. N. H. Slaughter, one of this company's radio engineers just returned from Rio. "Our signals were heard by a government radio station in Honolulu. This is the long distance record for a 500 watt radio transmitter."

This broadcasting station was installed shortly after the opening of the Brazilian Exposition at Praia Vermelha, a suburb of Rio de Janeiro, where the National Telegraphs, the government bureau of communications, had established as an official section of the Exposition, a special building for radio exhibits. The apparatus used is a standard 500 watt radio transmitter identical with that at WEAF, WCC, WSB, and other well-known stations equipped with Western Electric appartus.

The antenna is of a very unusual type. It is a six wire cage antenna extending 500 feet above the station, the upper end being suspended from a cable strung between the tops of two mountains, Urca and Babylonia, near the famous Sugar Loaf Mountain.

The programs broadcast by this station were received at the exposition and amplified by the Western Electric public address system for the enjoyment of the thousands of visitors there.

This station, SPE, was also used in a point-to-point radio demonstration between Rio de Janeiro and Sao Paulo, 225 miles distant. The speeches of the Brazilian Minister of Agriculture and other government officials and music were transmitted to Sao Paulo where they were received and amplified for a loud speaker which made the entertainment audible to the crowds gathered there. This is also a remarkable feat, as the tests were made in summer and in the daytime when radio transmission is most difficult. In addition the country between is exceedingly mountainous and is covered by a thick tropical verdure which absorbs an excessive amount of the energy passed from one station to another. It proved to be the most difficult location as yet encountered by this company's radio engineers. Their findings will prove an interesting page in the history of radio development.

Teaching by Radio to Be Tried Via WJZ

STUDENTS in the Haaren High School, New York City, will have the distinction of being the first to hold a class without an instructor present. Mr. H. W. Leyenberger, an instructor in machine accounting, will be located in the Waldorf Studio of the Radio Corporation—Westinghouse Station WJZ—and will conduct the class in accounting from there.

This novel experiment, which is taking place with the approval and under the auspices of the Board of Education of New York, is for the purpose of showing how radio can become a great factor in the educational field, both from the instruction and administrative viewpoint.

The experiment will take place on 360 meters. There has been installed in the Haaren High School classroom, where there are thirty accounting machines, a receiving set with loud speaker equipment. Mr. Leyenberger will give specific instructions by radio to the class, who will perform the operations indicated. Another receiving set will be located at the Board of Education in the office of the Associate Superintendent, Dr. Clarence E. Meleney, who is in charge of the high school. He and the other superintendents may then listen to this instruction along with many thousands of people equipped with receivers, working at that time.

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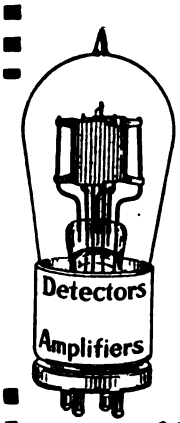
FREE MANUFACTURERS PATENT CO., INC. BOOK 520 FIFTH AVE NEW YORK

FREE Illustrated Booklet on Radio Frequency Amplification with circuit diagrams and operational characteristics. By LESTER L. JONES Formerly Expert Radio Aid, U. S. N.
DANZIGER-JONES, INC.
(Sole Licensees)
143W PRINCE ST., NEW YORK, N. Y.



GUARANTEED REPAIRS
Broken and Burned-Out
VACUUM TUBES
W.D.-11 not accepted for repair
Your dealer should know, but if he does not, send direct to
HARVARD RADIO LABORATORIES
Boston 9, Mass.
Tubes returned Parcel Post C. O. D.

The Niftiest Short Wave Tuner on the Market Only $6.00 & PP on 1 lb. Send for pamphlet.
L. W. GOODMAN
DREXEL HILL, PA.
The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

Auxiliary Condensers

THE operation of radio receiving sets can be improved by the use of a very simple and cheap condenser connected across the telephone receivers and a similar one connected in series with the antenna, according to the Bureau of Standards of the Department of Commerce. Longer waves can be received by the use of a very simple type of loading coil. The coil is particularly useful in connection with the single-circuit receiving set.

The auxiliary condenser which is used in series with the antenna, and the loading coil, may also be used when the crystal detector is replaced by an electron tube detector unit, or when an amplifier is added to the receiving set.

The condenser used in series with the antenna makes it convenient to tune to wave lengths less than 300 meters. The condenser used across the telephone receivers increases the intensity of signals which are received from some radio stations. The loading coil enables the equipment to respond to wave lengths above 600 meters, up to about 3,000 meters. Time signals from high power stations can thus be received. The use of the loading coil also increases the receiving distance of the equipment, because many of the higher power stations use longer waves.

Mr. Albright Points Out an Error

EDITOR, RADIO WORLD; I have just received the March 17 issue of RADIO WORLD, in which you published my article, "How to Build a One-Tube, Dry-Cell Set." I notice that the cut of the circuit shows a connection between the aerial and ground across the inductance coil. It seems that you have reproduced this cut from the pencil drawing, so I must have shown it so. The set will not function if this connection is made; and, in justice to the many fans who will try this circuit out, I wish that you would call their attention to this error.

I have written to about a hundred and fifty fans who have asked me for the circuit, and I have advised them to get RADIO WORLD and read the article.

Thanking you in advance for calling your readers' attention to the error, I remain

Very truly yours,
Englewood, Colo. P. F. ALBRIGHT.
March 30, 1923.

RADIO TUBES REPAIRED
"Guaranteed Equal to New"
FOUR DAY SERVICE
6 V. Detectors, $2.50; Amplifiers, $2.75;
5 Watt Power Tubes, $4.00
Radiled Tubes Always in Stock
Our repaired tubes speak for themselves.
Radio Tube Laboratories, Inc.
776 Broad Street Newark, N. J., U. S. A.

Standard Merchandise at Cut Rate Prices

	List Price	Our Price
Framingham Plain Rheostats	$ .75	$ .45
Framingham Vernier Rheostats	1.25	1.10
Kleiner Vernier Rheostats	1.50	.90
Kleiner Vernier with Dial	1.50	1.00
Freshman Variable Grid Leak	1.00	.70
Rapco WD-11 Transformers	5.00	3.95
Cleo Two-Way Plugs	1.00	.75
Pilot Plugs	1.00	.65
Werkrite Variometer	3.50	2.95
Werkrite Variocoupler	3.50	2.95
Werkrite Headphones	6.50	7.00
Werkrite Loudspeakers	12.00	10.00
5" Dials	1.00	.85
Rapco Phonograph Attachment	1.00	.70

CASH OR MONEY ORDERS WITH ORDER. RAPCO PAYS ALL PARCELS POST CHARGES.
RADIO PRODUCTS CO.
147 West 23rd Street, New York City, N. Y.

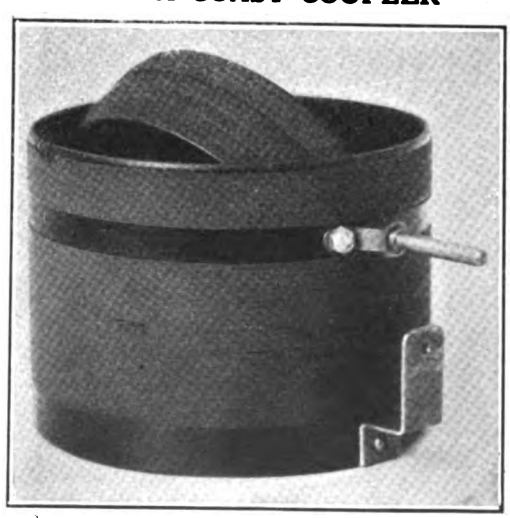
"The Little Wonder"
FOR BOYS AND GIRLS
CRYSTAL SETS
Unassembled-Net **$3.50**
Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at $5.00.
GUARANTEED TESTED CRYSTALS
Galena 15c **Radiosite 20c**
Write for Free Catalog
It lists all our radio parts and supplies.
Holloway Elec. Supply Co., Inc.
228 Third Ave. New York City

TO GET THAT DISTANT STATION
USE A COAST COUPLER

This coupler is designed along strictly scientific lines, and is the result of eighteen months' experiment. Wound with green silk covered wire on Bakelite tubing. Very selective.

Following are a few of the many DX stations received with this coupler, and detector tube only, at Long Beach, California:

PWX, Havana, Cuba
WWJ, Detroit, Mich.
WSB, Atlanta, Ga.
WDAP, Chicago, Ill.
CFCN, Calgary, Can.
WBAP, Ft. Worth, Texas



Our adaptation of a popular hook-up furnished with coupler. Coupler fully guaranteed when hooked up according to instructions.

Coupler and diagram, sold only under our money back guarantee. Mailed anywhere in the United States upon receipt of $5.00. Post Office or Express money order.

Make All Remittances Payable to
COAST COUPLER COMPANY
221 WEST SEVENTH ST.

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ECLIPSE RADIO CORP.
414 WEST 42nd STREET
One of Our Specials!
$45.00 WRIGHT SET, $26.75
Here's a set that will solve your long distance problems. Have you seen the "Wright" Hook-up? Come in and inspect it. Complete with tube and B and A batteries.
A complete line of all standard Radio Supplies at lowest-in-the-city prices.

B Batteries That Last for Five Years

SIDBENEL RADIO EQUIP. MFG. CO.
25 Mt. Eden Ave. 25R New York City

WE REPAIR YOUR VACUUM TUBES
W. D. 11.....$3.50 U. V. 201 A..$3.75
U. V. 200 & 201 3.00 De Forest A. P.. 3.00
De Forest D. V. 6....$3.75
Our 1-½ V. Detector Tubes, $4.50, are excellent.
MAIL ORDERS SOLICITED
ABALENE RADIO COMPANY
416 Broadway, New York City Tel. Canal 5127

No Free List

RADIO WORLD has no free list. The only copies sent out by the publishers are to fill the ever-increasing orders of the American News Company, the large numbers of subscription orders received at the office of publication, and one voucher copy to each advertiser and advertising agent represented in current issues.

Additional

Mail Order Specials

Prices on items in last week's issue of Radio World still hold good.

CONDENSERS	Selling Price
U. S. Tool—43-P. Vernier	$5.00
D. X. Vernier—43-P	4.50
American—43-P.	2.75
A. Z. Magnus—43-P.	2.00
AETACO—43-P.	1.75
AETACO—23-P.	1.35
AETACO—11-P.	1.00
All 3-Plate Condensers	.00

TRANSFORMERS

Radio Frequency

Federal with Mount	$5.50
Radio Corp. UV 1714	5.20
Radio Service RT62RT8	5.00
Mu-Rad with Mount	2.00

Audio-Frequency

Radio Corp UV712	$5.00
Federal	4.50
General Radio	3.75
Acme	3.50
Thordarson	3.00
W. D. 12	3.50
Creco	2.45
Amertran	5.50
DeForest	3.00

POTENTIOMETERS

Federal	$0.85
Radio Corp.	1.75
General Radio	2.45
A. R. S.	.50
Framingham	1.10

American Radio Stores
235 Fulton Street New York City
All orders must include postage, and all checks must be certified.

New Offer of Westinghouse Stock

THE Westinghouse Electric and Manufacturing Company, at a directors' meeting held last week, authorized the sale of $14,962,530 additional common stock, which will be offered to stockholders at a subscription price of $53 a share, to the extent of one share of new stock for each five shares now held. The offer will be made to stockholders of record April 16. Payment for the stock must be made in full by May 31.

Guy E. Tripp, Chairman of the Board of Directors, has issued a letter to stockholders, in part as follows:

"Your company has a large amount of unfilled orders on hand, and is taking additional orders in large volume. In addition the directors believe that there will be a still further enlargement in the demand for your company's products, due to the public attention which is now being directed toward hydroelectric developments, steam railroad electrification, industrial electric manufacturing processes, further development of activities in the radio field, and a widening use of electricity for other purposes, all of which would stimulate still greater activity in your various manufacturing lines.

"After applying the proceeds of the sale of the new issue of common stock the net quick assets of the company, as of March 31, 1923, will amount to $105,000,000."

Gen. Harbord Says Production of WD-11 Tubes Is Nearing Demand

Rumors have been spread that the manufacturers of the WD-11 tube have been holding back production and have as often been denied. Gen. Harbord, president of the Radio Corporation of America, last week issued this statement:

"I give you my word there is no truth in that charge. I have heard it before, and there is no basis for it. On the contrary, we are trying to increase the production of the WD-11 tubes as much as possible. Why should we not? We asked for a production of 7,500 a day of those tubes as long ago as the middle of February. They have now reached a production of 5,000 a day, and in about two weeks I hope they will have reached a production of 10,000 a day. Then the demand will be taken care of very quickly. There have been many blasphemous and scandalous things said about us, on the theory that we were holding up production, but I assure you we are doing our best to meet the demand."

General Electric Reports a Tremendous Business

THE annual report of the General Electric Company, as of December 31, 1922, shows total income of $30,794,966, as compared with $28,676,683 in 1921, and net income from sales of $22,736,281, as against $21,676,683. Profit available for dividends was $26,231,019, compared with $21,652,812 in 1921. Cash dividends were $14,073,628, as against $13,409,522 the previous year. This left a surplus in excess of cash dividends of $12,157,391, as compared with $8,243,290 in 1921. Total surplus was $73,167,047.

Net sales billed were $200,194,294, as against $221,007,991 in 1921; but cost of sales declined to $177,458,012, as compared with $199,331,308 the previous twelve months. Orders received were $242,739,527, compared with $179,721,680 in 1921, an increase of 35 per cent. Unfilled orders at the end of the year were $76,220,000, as

STANDARD APPARATUS

At Attractive Prices. Watch This Column EACH WEEK. It Will Pay You.

Complete Parts to

BUILD YOUR OWN TUBE SET, $15.00

Shamrock Variocoupler
3 Inch Dial
7 x 12 Bakelite Panel
Kloesner Rheostat
Socket
Grid Leak and Grid Condenser
Rubber Binding Posts
12 Feet Buss Bar Wire
Switch Lever and Switch Points
23 Plate Variable Condenser (Made by John Firth)
Complete Book of Latest Circuits

A GUARANTEED 1½-Volt TUBE FREE with ABOVE PARTS

CABINETS These are carefully constructed of genuine mahogany, hand rubbed. The tops are hinged for easy access to interior. They are made to fit your parlor.
7 x 10.....$3.35 7 x 14.....$3.75 7 x 24.....$4.50
7 x 12.....$3.50 7 x 18.....$4.00

PHONES N & K, German manufacture, 6000 ohms resistance. Nowhere at any price can you equal the supreme sensitiveness of these phones, and we stand ready to demonstrate this claim to your satisfaction. **$5.75**

HEAD SETS

List Price		Our Price
$8.00	Brandes .....Superior.....	$5.50
8.00	Dictograph	5.75
8.00	Federal 2200 Ohms	4.95
7.50	Stromberg Carlson	4.75
6.00	Frost 3000 Ohms	4.25
6.00	Royalfone	3.75
5.50	Murdock Type 57	4.10
12.00	Western Electric 509W	9.50
12.00	Baldwin Type C, Master	8.50
6.00	Baldwin Type C, Single	4.00

LOUD SPEAKERS

$161.00	Western Electric	$145.00
55.00	Western Electric	50.00
45.00	Magnavox (New Type)	31.50
40.00	Callophone	30.00
20.00	Dictograph	15.00
15.00	Brittania	12.50

AUDIO TRANSFORMERS

List Price		Our Price
$7.00	Federal	$5.60
7.00	Radio Corp U. V. 712	5.60
6.50	Resia	5.10
4.50	Thordarson	3.00
6.00	Amplex W. D. 12	3.95
5.00	General Radio	4.35
6.00	Jefferson	5.00
7.00	Amertram	5.95
5.00	Acme	4.10

PANELS

BAKELITE—3/16 inch Stock

7 x 10	$1.35	7 x 15	$1.95
7 x 12	1.45	7 x 18	2.50
7 x 14	1.85	7 x 24	2.95

HARD RUBBER—Grade A

7 x 10	$0.90	7 x 18	$1.45
7 x 15	1.35	7 x 24	1.90

MISCELLANEOUS SPECIALS

Firth 23 Plate Condenser	$1.30	Firth Crystal Detectors	1.00	180° Variocoupler	2.79
Firth Triple Sockets	.90	Brach Lightning Arrestor	1.25	Vamometers	2.75
Firth Double Sockets	.70	Bulldog Phone Plugs	1.00	Vernier Rheostats	1.35
Millard Rheostats	.45	Three Coil Mountings	3.50	11 Plate Condenser	1.35
Double Phone Cords	.60	Two Coil Mountings	2.75	43 Plate Condenser	2.15
Fada Type Switch Levers	.23	Single Coil Mountings	.50	W D 11 Sockets	.30

Full Line of ALL STANDARD SETS and ACCESSORIES at Greatly Reduced Prices

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15 E. 14TH STREET, NEW YORK CITY Bet. 5th Ave. and Union Square

Parts to Make Up
REINARTZ CIRCUIT

This circuit is exceptionally quiet in operation. Works on small or indoor aerial. Very selective. Brings in long distance.

1 Reinartz Coil	$2.00
1 23 Plate Condenser	1.75
1 13 Plate Condenser	1.15
1 Socket (Condensite)	.80
1 Rheostat Vernier	1.25
3 Switch Levers, Fada Type	.57
16 Contact Points	.16
1 Grid Condenser	.15
8 Binding Posts	.32
1 Bakelite Panel	2.50
5 Lengths Bus Wire	.20
1 Audion Tube UV 200	3.99
1 22½ V. B Battery	.96
1 6 V. 60 Amp. Storage Battery	9.50
1 Cabinet, Mahogany Finish	3.75
Total	$28.83

Our specialty is making up complete assortment of parts for Flewelling, Reflex, and other circuits.

WE SELL:

45 V. "B" Batteries (each)	$2.25
6 V. 60 Amp. Marko's Battery	9.50
U. V. 200 Tubes	3.95
U. V. 201 Tubes	5.50
U. V. 201A Tubes	6.50
Nathaniel Baldwin Type C, Double Phones	8.50
Nathaniel Baldwin Type C. Single Phones	4.50
Brandes (Superior) Phones	5.99

All orders must be accompanied with a money order, postage included.

GRAND RADIO CO.
1789 Third Ave. 1714 Second Ave.
NEW YORK CITY

Edison 1½ Volt A Battery	$4.75
150-3000 Meter Couplers with free diagram	4.00
45 Volt B Batteries	1.75
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Amco Audio Transformers	3.00
Special WD-11 Transformers	3.00
King Variometer	2.25
Small Type Variometer	1.75
Coupler, 14 taps, Pig Tail Connection	1.25
Tru-Tone Loud Speaker	4.75
23 Plate Condensers	1.25
3 Plate Vernier	.75
Radiocette Crystal Sets (as loud as a tube set)	5.00

3 lengths of bus wire free with every $3.00 order or over.

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Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20?

This hook-up actually goes out and drags the distance in, and lays it at your table.

All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?

If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
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1493 BROADWAY, NEW YORK, N. Y.
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Technical Editor: Robert L. Dougherty

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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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A Good Thing—Pass It Along!

An especially valuable article is that published in this issue of RADIO WORLD on the construction of a new form of two unit radio receiver. In writing this description of the set as well as in the careful drawing of the plans, the author has taken nothing for granted except to assume that the reader has a slight knowledge of an aerial and knows one radio instrument from another. This article is just the thing for an established amateur to turn over to a comrade who has not a radio set but who is thinking of building one. The more advanced readers of RADIO WORLD can further the common cause by telling prospective amateurs about this interesting article.

How to Drill Holes in Glass

Grind a three-cornered file to a sharp point and use it as a drill after first pouring turpentine on the glass at the point where the hole is to be.

Which are you?

A small timer or do you bat in the Big League?

Do you like to reach over states and pull in the breezy line from the far West or hot stuff from down in Texas, or maybe the business twang of the good old East? Now that you've answered this questionnaire, remember that if you want Distance you want instruments built for Distance.

A Word to the Wise: Buy DX Instruments from D-X-Radio

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Genuine "Bull Dog Grip" Plug, 65c

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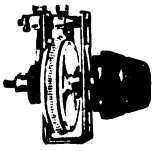

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Cutler Hammer Plain, regularly sold at $1.00. Our Price ..... 80c.

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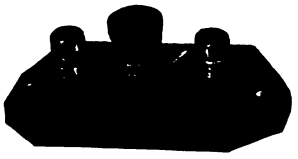

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

TUBE SET, $5.50. Vernier Rheostat, Variable Condenser, Dial, Coil, Leak, Socket, Posts, Panel, Wire, Instructions. Circuit has heard 1,000 miles. Kinsman, 4625 N. Hermitage, Chicago.

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RADIO FREQUENCY AMPLIFICATION. Get the best results with radiophone reception. Long distance reception, purity and volume of tone reproduction, static reduction and selectivity. We have working plans, blue prints, with exact specifications of parts to assemble to construct a three tube set. Gives marvelous results. Save worry and experimentation in building one of these sets. Any amateur can build. Guaranteed results. Sent for $1.00. postpaid. Research Laboratories, Carthage, Mo.

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DO YOU WANT TO SAVE MONEY in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15c a copy, or start your subscription with this issue. RADIO WORLD, 1493 Broadway, New York.

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BUILDERS AND EXPERIMENTERS. Do you know that the Reflex circuit is one of the most interesting circuits to construct? You can not guess how much fun you are missing if you fail to try out at least one of these circuits. See RADIO WORLD issues of Feb. 24 and March 3. They contain two fine articles by W. S. Thompson, with plenty of new Reflex circuits to experiment with. Don't miss these! 15c. a copy. RADIO WORLD, 1493 Broadway, New York City.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Radio World, published weekly at New York, N. Y., for April 1, 1923.

State of New York,
County of New York, ss.:

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Roland Burke Hennessy, who, having been duly sworn according to law, deposes and says that he is the Editor of the Radio World, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Hennessy Radio Publications Corporation, 1493 Broadway, N. Y. C.; editor, Roland Burke Hennessy, 1493 Broadway, N. Y. C.; managing editor, Stephen L. Coles, 1493 Broadway, N. Y. C.; business manager, none.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock): Hennessy Radio Publication Corp., 1493 Broadway, N. Y. C., Roland Burke Hennessy, 1493 Broadway, N. Y. C.; M. J. McArthur, Statler Hotel, Cleveland, Ohio.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear on the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date above shown is.....weekly. (This information is required from daily publications only.)

ROLAND BURKE HENNESSY,
Editor.

(Sworn to and subscribed before me this 31st day of March, 1923.

KARL E. GOTTFRIED.

Notary Public, New York County. New York County Clerk's No. 301. New York Register's No. 4228. Commission expires March 30, 1924.

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Editor Radio World:

It is both a pleasure and an honor to congratulate you upon the successful completion of the first year of RADIO WORLD.

We know of no other magazine in the whole wide world that gives so much up-to-date radio news and wireless information as RADIO WORLD. Indeed, we know of only one other weekly wireless publication, and that is the official organ of the Wireless Society of London.

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We wish you continued success from a literary as well as a financial standpoint, and it seems to us that anyone interested in radio or wireless, once he has seen RADIO WORLD, should not hesitate to subscribe to it.

Monthly publications are all right, but what radio fan wants to wait a month to read something new?

Yours very truly,
P. C. KULLMAN & CO.
New York City,
March 31, 1923.

British to Investigate Transatlantic Wireless Phone

WITH a view to investigating the possibility of developing commercial wireless telephony across the Atlantic Ocean the Postmaster General of Great Britain has appointed a committee, which includes Admiral Sir Henry Jackson, Major General F. H. Sykes and a number of technical experts, to advise what practical steps may be taken in the premises. The Postmaster General says it is understood the telephone authorities in the United States are willing and anxious to co-operate.

Radio Fan Goes to See Opera After Broadcast

AFTER hearing the broadcasting of the Wagnerian opera "Die Meistersinger" several weeks ago from the Radio Corporation-Westinghouse Station WJZ in Newark, N. J., John E. DeShazo, a Newark fan was so impressed that he decided to see the opera first hand. Here is a case where radio helped to popularize the opera and the sale of tickets for the theatre. Mr. DeShazo bought seats to see "Tannhauser" which was broadcast from WJZ not long ago.

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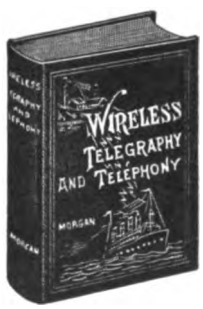

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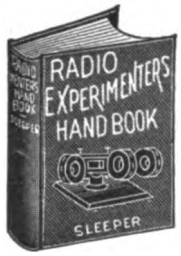

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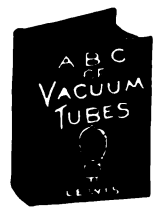

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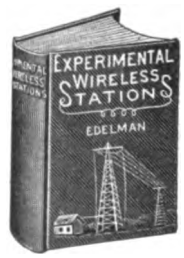

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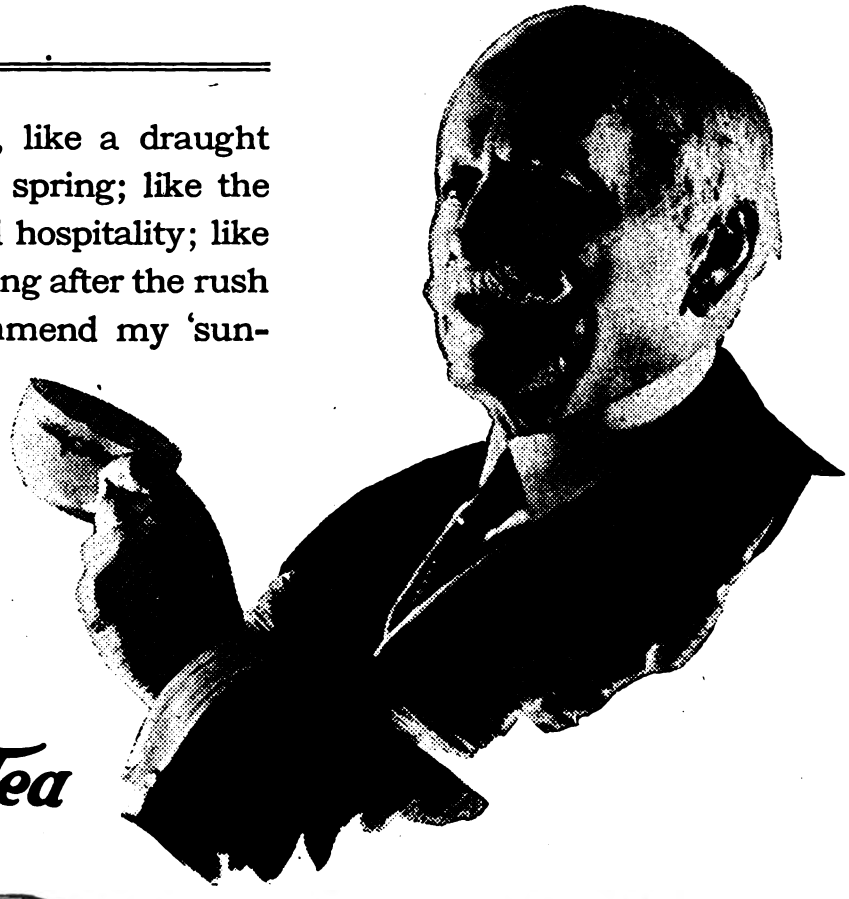

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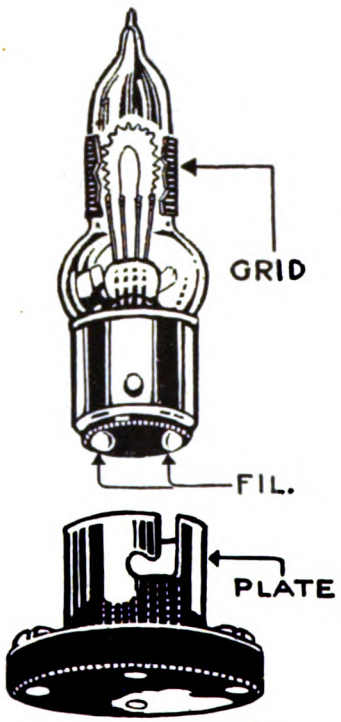

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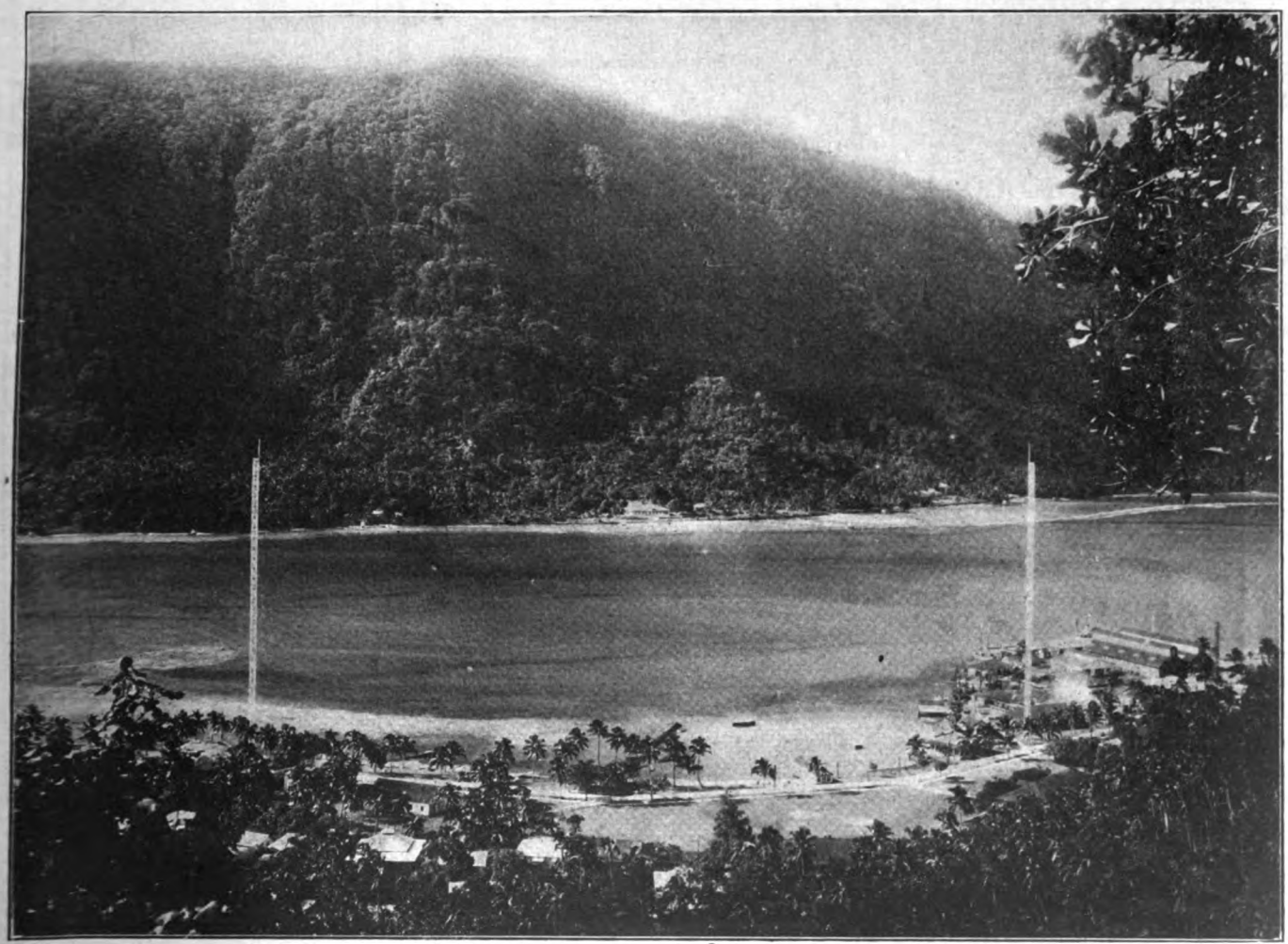

(C. Underwood & Underwood)

An American radio station in the beautiful South Sea islands. This unusual picture shows the United States Government Wireless Station at Pago Pago, on the American-owned island of Tutuila in the Samoan group. It is an important link in the Navy chain of radio stations.

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Radio Engineer for Bureau of Standards

DR. AUGUST HUND, of Berkeley, Cal., has been appointed electrical engineer in the Radio Section of the Bureau of Standards, Department of Commerce. Dr. Hund is a Doctor of Engineering, having geen graduated from the Technische Hochschule, Carlsruhe, in 1913. He served two years under Dr. Steinmetz in the General Electric Company and is author of a technical book on frequency measurements. For the past several years he has been doing graduate work at the University of California.

Adams County Radio Club

A RADIO club under the name of Adams County Radio Club has been organized in Gettysburg, Pa. The following officers were elected: President, Earl G. Ports, operator of Station 3BHY, Gettysburg College; vice-president, G. E. Slaybaugh; secretary-treasurer, H. W. Baker, operator of Station 3CBJ, Gettysburg, Pa. The club will hold weekly meetings in the physics lecture room of Gettysburg College. Papers by various members will be read, and code instruction given. Study and design of radio apparatus and other problems of importance in radio work will be among the activities of the organization. The two radio telephone stations operated by members of the club—3BHY, with 50 watts power, and 3CBJ, with 10 watts power—will be used to further club organization and interest. The club would be pleased to have reports from those hearing these stations.

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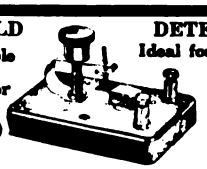

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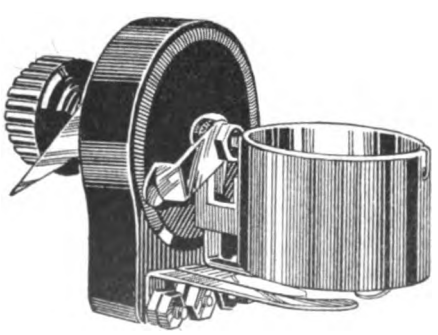

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EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak 1 23-plate .0005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit $11.00

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 4. Whole No. 56 | April 21, 1923 | 15c. per copy, $6.00 a year

Hook-up of the Haus Transmitter

By John Kent

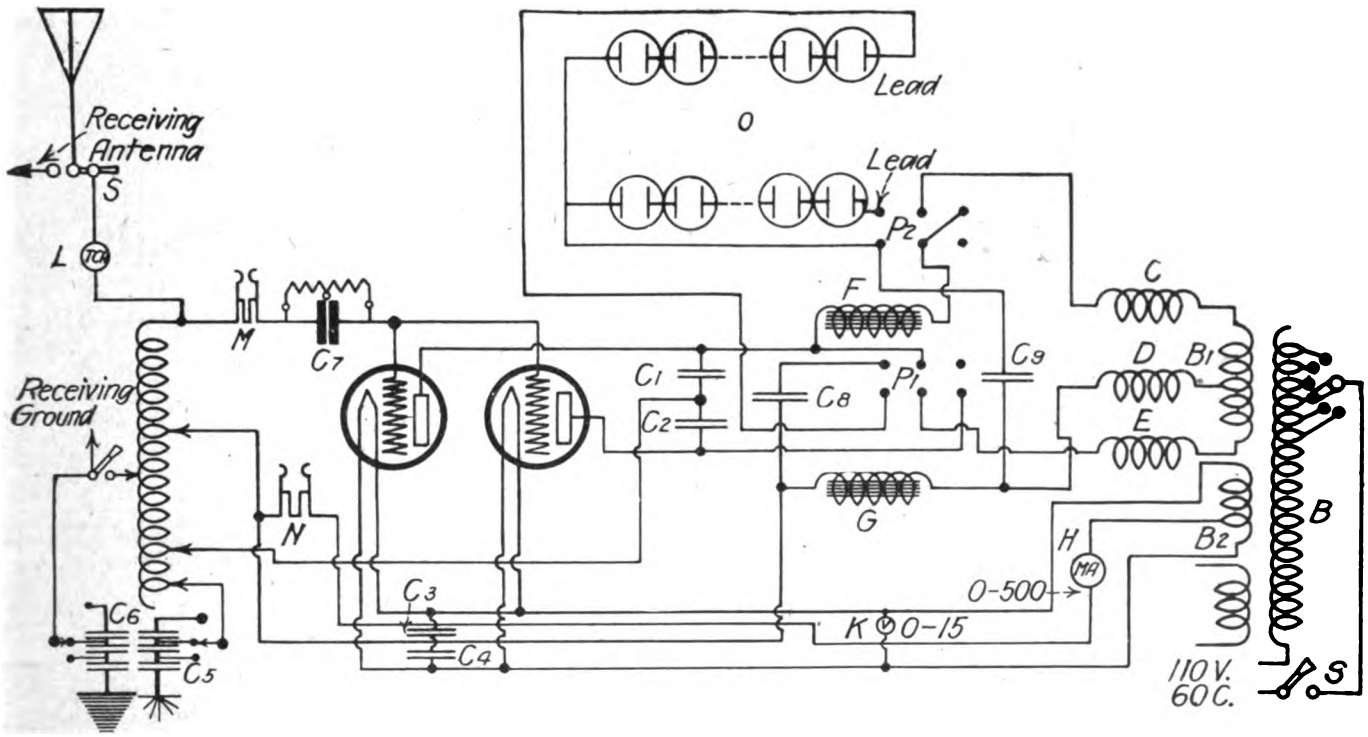
IN response to inquiries from many readers of RADIO WORLD, the hook-up of the transmitter devised by Paul Haus, radio amateur, whose call is 2VK, is published herewith.

As can be seen, the transmitter uses two tubes, getting the current for both the plate and filament through the agency of a combination transformer, which permits Mr. Haus to supply 12 volts for the filament and 1,500 volts to the plate, if he wishes to use that much. By the jack and plug arrangement, described in RADIO WORLD for April 7, 1923, it is permitted to use either a chopper or straight key. The jacks are shown in the diagram at M and N. The jack M is for either the chopper or a microphone, whichever is employed, but which Mr. Haus uses only for ICW with the chopper. The jack N is for the key, when it is necessary to use straight CW.

This transmitter is powerful and at the same time is not difficult either to construct or operate, and should prove a welcome answer to many readers who have written to us to describe a similar transmitter.

For those contemplating the building of such a set, a look at the carefully worked out cabinet and set, as shown in RADIO WORLD for April 7th, will give the prospective builder some ideas that he can very easily incorporate in his set, such as the method of mounting the tubes, the meters, and the easy throw-over switch from receiving to transmitting.

The hook-up published herewith is sufficiently plain and the caption describes the different parts,



C1 and C2, High Voltage Condensers of .002 Mfd.
C3 and C4, Bypass Condensers, .0005 Mfd.
C5 and C6, Series Condensers, .0003-4-5 Mfd.
C7, Grid Condenser, .0005 Mfd.
C8 and C9, Filter Condensers, 1 Mfd.
A, Tuner, 33 turns of No. 10 BSC wound on bakelite core, diameter 5 inches.
B, Transformer (C.W.), 750 Watts.
C-D-E, 200 D-L or Honeycomb Coils.
B1, High Voltage winding, 1,500 Volts each side of center.
B2, Filament Winding, 12 volts terminal.
F, G, Iron core choke coils of 1½ henries each.
H, Milliameter.
I, Grid Leak, 2,500 Ohms resistance.
K, Voltmeter 0-15 volts A.C.
L, Thermo-couple radiation ammeter, range up to 5 amperes.
M, Jack for chopper or microphone transformer.
N, Jack for key when CW is used.
O, Chemical rectifier, (Aluminum-Lead with borax solution), 48 jars in bank.
P1 and P2, Double throw switch (4 pole).
The tubes used in this set are U. V. 203, 50-watt.

The above references to the diagram make the Haus hook-up easy to understand.

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A Novel Double-Control, Back-Panel Switch

By Arthur G. Shirt

THERE are a number of interesting features about the novel switch described and illustrated in this article which commend themselves to the amateur looking for the last word in switch construction. The switch is a double-control device, by which not only the number of turns on the primary of the variocoupler may be varied, but also the position those turns occupy on the tube of the primary. The advantage of the duo-control is immeasurable. Many amateurs would not be without it. Although mounted on

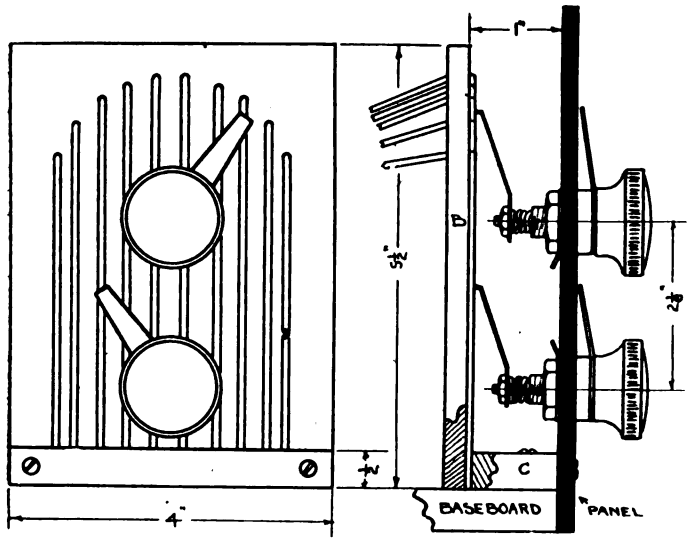

Fig. 1. At the right is shown how the wires are brought out from the coil to the sub-panel to serve in place of taps. At the left is shown how the switch arms are mounted, as well as how to mount the sub-panel.

the baseboard of the cabinet to the rear of the panel, this switch is operated from the face of the panel by two neat knobs, situated to the right or to the left of the dial which controls the rotor of the variocoupler. The switch is easily constructed, having been

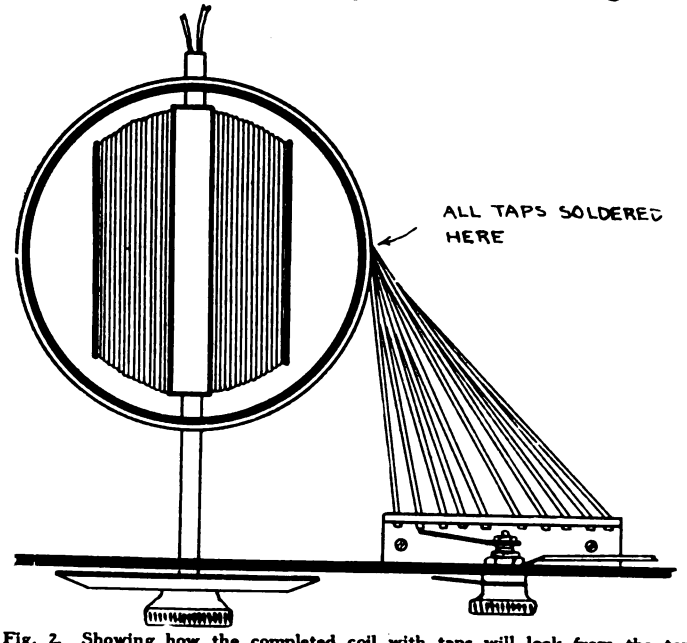

Fig. 2. Showing how the completed coil with taps will look from the top of the cabinet and giving a good idea of how to mount them on your panel.

designed so that its simplicity would appeal to those who cannot, or who haven't the chance to, do skilled work. There is no soldering in the building of the control itself, since the very leads which come from the taps of the primary coil are ingeniously made to serve as the switchpoints. When completed, this double-control switch is an instrument by itself, which may be moved from place to place in the cabinet without leaving a semicircle of unsightly holes in the panel.

The material needed—that is, for the particular size switch-arms shown in the illustrations—is a piece of hard rubber, composition, fibre, (or hard wood if these first three are not available) four inches wide, 5½ inches long and about ¼ inch thick. The same material of which the panel is made should serve admirably. This rectangular piece of material is the upright base for the switch. It is marked with the letter B in Fig. 1. A second piece of somewhat thicker material (about ½-inch) is cut one inch wide by four inches long. This serves the triple purpose of a space block between the front of the switch base and the back of the panel, of a means by which the switch base is held upright, and of a "clinch" strip which holds the contract wires in place. It is marked C in Fig. 1.

Two switch knobs, such as may be purchased as separate units, will be needed. You will find that most of them are designed along the lines of the ones shown

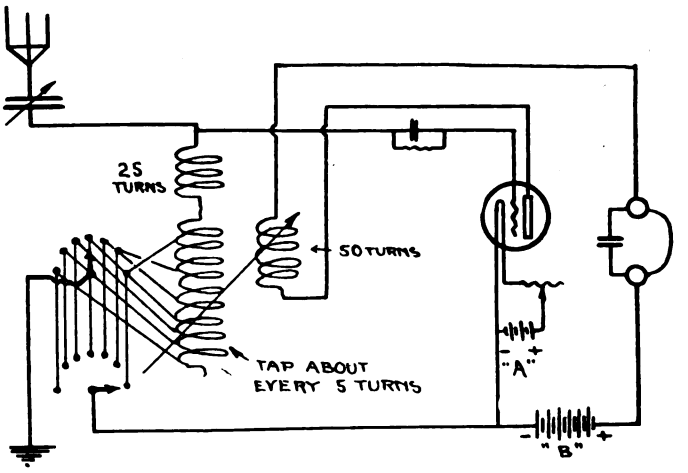

Fig. 3. A hook-up for the double control coupler. A WD-11 works admirably with this circuit, and by the use of the double control primary switch extremely sharp tuning is made possible.

with this article, so that the switch arm may be taken from its "front panel" position and shifted to a place in the rear. A pointer replaces the switch arm, and a semicircular scale is mounted suitably on the panel. With a switch arm about 1½ inches long, the distance between the centers of the two knobs should be 2½ inches or a trifle more. They are mounted in a vertical line, one above the other. This part of the construction is better done first than last, on account of the connection which goes to each switch arm.

The next step is to determine how many taps will come to the switch. The number decided upon should then be spaced off evenly on one edge of the bottom "clinch" strip, leaving a margin on each end of ½ inch. With a hacksaw, or a jackknife, groove each measurement on the edge of the strip so that there is a notch for each tap. Make the grooves no deeper than the thickness of the bare copper wire or the square bus bar material used as the switch leads. Drill two holes in the strip by which to bolt it to the upright base, and two others by which to screw it to the baseboard.

Now turn your attention to the rectangular switch base. Lay off a vertical center line up and down the piece. Measure down two inches from the top on this

(Continued on next page)

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How to Use a Two Element Vacuum Tube

By Harold B. Turner

EVERYONE who builds his own radio outfit desires to receive over a maximum distance with a minimum expenditure. The writer recently constructed a receiver which is far more sensitive than a crystal outfit and is more satisfactory and reliable in its operation. In fact, the writer's results have been so pleasing that he thought he would let his brother fans know how to do the same thing.

Nowadays everyone wants a vacuum tube set and yet everyone cannot afford to invest in the necessary storage battery, "B" battery and the other accessories that go to make up receivers of this type. While shopping around recently, I came across a new Fleming type vacuum tube which I purchased complete with all accessories for $2.50. This was a two-element tube operating from dry cells. The receiver circuit outlined in the diagram was set up and perfect reception was made possible. Previous to the purchase of this vacuum tube, I was using a crystal receiver. With the vacuum tube I was not only able to pick up stations that I had never heard before, but the quality of the reception was every bit as good as that obtainable with a good crystal set, and there was an entire absence of circuit noises and howling. In fact, one cannot make a two-element tube howl no matter how hard one tries.

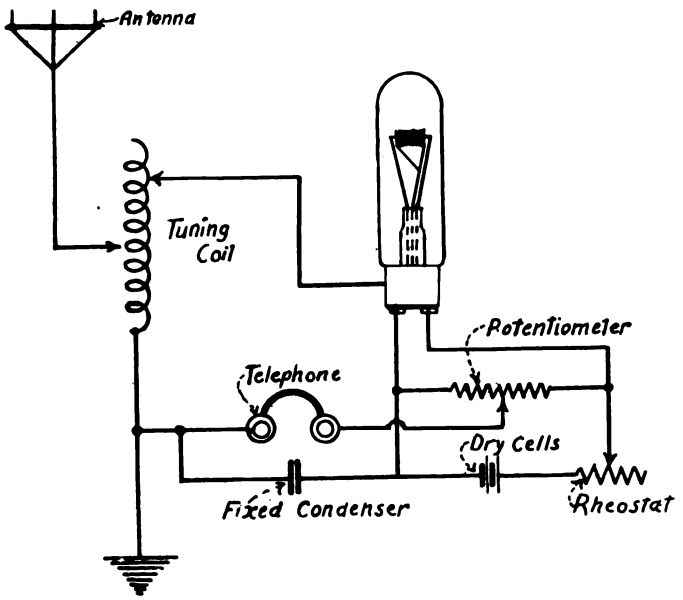

Fig. 1. Hook-up used by Mr. Turner with a Fleming type vacuum tube.

I have had such good results with this vacuum tube that one of my friends asked me to change his crystal set over into a vacuum tube set employing this same type of tube. I did not find it necessary to completely demolish his crystal set to make the necessary changes. In fact, I used all of the instruments of the old crystal set with the exception of the crystal.

The rheostat is carefully adjusted until the signals are loudest. When the rheostat was placed at the proper point, I did not find it necessary to adjust it further and tube retained its same degree of sensitivity for several hours. It is evident that it would not be advisable to operate these tubes without a rheostat as that would allow too much current to pass through the filament from the battery.

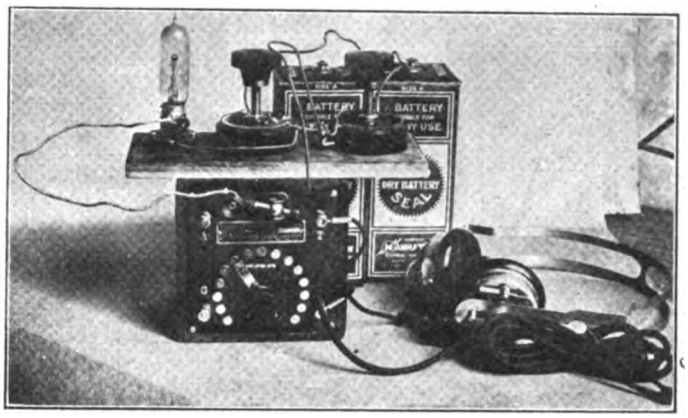

Fig. 2. Mr. Turner's two element vacuum tube set assembled.

The advantage of permanent adjustment of this arrangement will appeal strongly to those who have been troubled with crystal detectors. Crystal detectors are fine, but they do get out of adjustment and here is something that gives us just as good quality, greater distance and no trouble in adjustments.

In the way of experimenting I set up a second circuit, using a 200 ohm potentiometer. This allowed me to make the filament negative or positive. By the use of this arrangement the results were found to be a little bit better, but those who cannot afford the addition of the potentiometer can be assured that they will get good results well worth the trouble by using the other circuit.

(*Continued from preceding page*)

center line, and using the resulting point as a center, describe a circle on the switch base 1½ inches in diameter. Lay off at the bottom of the rectangular piece the same number of points as on the edge of the clinch strip, spaced the same way. Draw lines up from these points, and where the lines cross the upper half of the three-inch circle, there drill the holes for the insertion of the contact wires or bus bars.

It will be seen at this point in the explanation that the number of taps must be spaced off on the edge of the clinch strip within the compass of the particular sized arm on your switch knob. In the case illustrated, the compass is three inches.

When the holes are drilled the base is ready for the insertion of the leads. Preferably the leads should be of that silvered bus bar material which is sold for inside wiring on radio receivers. They may be of No. 7 or No. 9 bare copper wire, in case these bus bars are not obtainable. As many pieces are needed as there are taps on the coil. The proper length is from ten inches to one foot, according to how far away from the coil the switch is going to be located. For, as already mentioned, the same wire which serves as a switch contact goes directly to its particular turn on the variocoupler, where it is soldered at once to the tap. Fig. 2 illustrates this.

When you are selecting the drill for the holes, pick one that is slightly smaller than the wire or bar used. This difference in size will hold the wires in at the top of the switch base.

Now screw the completed instrument to the baseboard just behind the two switch arms, and the double control is finished. Before connecting it up take a glance at Fig. 3, which is a typical application of the double control switch, so as to make sure you grasp the principles on which the control works.

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Radio Medical Service for Seamen Proves a Boon

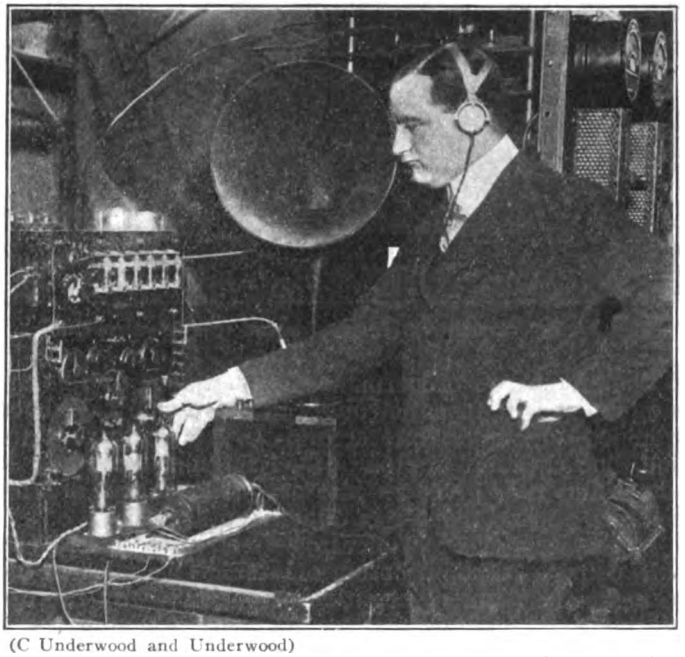
JUST a year ago the U. S. Public Health Service announced that it had completed arrangements to expand the medical aid service to American seamen, with which it had first been charged by Congress a century and a quarter ago, by prescribing by radio for any sailor who might be taken ill at sea and who might apply. Messages for aid were to be forwarded to the Service by the ship's radio via the Radio Corporation of America or the Independent Wireless Telegraph Company.

The range of diseases and mishaps for which aid has been invoked during the first year has been amazing. The list includes appendicitis, asthma, cramps, diarrhea, earache, eye injuries, heart disease, hernia, hiccoughs, influenza, infected teeth, malaria, opium poisoning, ptomaine poisoning and swallowing broken glass. Many of the diagnoses were made on board ship because sailors are resourceful in meeting emergencies. Sometimes interchange of several messages was necessary to obtain clear information as to the cause of the trouble. Cramps among the crew and later more cramps and worse cramps elicited the information that all the sick ate at a single mess. This known, treatment of the sick and means of preventing further cases were definitely outlined.

When the patient grows better and the captain's apprehension is relieved, the case usually drops from observation. Weeks afterward, perhaps, the interested hospital receives direct information as to what occurred later.

The "Ship's Medicine Chest" is a manual issued by the Public Health Service and carried by most ships.

Experimenting with Interference Preventers



(C Underwood and Underwood)

Professor Alfred W. Goldsmith, noted radio expert, and closely associated with numerous improvements that have been made recently, is here shown experimenting with apparatus which when completed, he hopes will eliminate all interference between transmitting stations to a degree that will be ideal. Professor Goldsmith is shown manipulating a receiver that incorporates several of his ideas, but that is at present not for publication. The receiver is the naval type which is much used now.

Public Health Information By Radio

THE end of the first year's existence of the Pioneer Health Information by Radio Service of the World, by which title the radio service of the United States Public Health Service is popularly known, finds it serving, in addition to NAA, Arlington, the Naval Radio Station, at Radio, Virginia, twenty-three co-operating broadcasting stations so situated as to serve practically every portion of the United States. Stations in Arizona, California, Colorado, Kansas, Massachusetts, Nebraska, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, New Mexico, New York, Ohio, Oregon, Pennsylvania, Texas, Utah, Washington, Wyoming and Ontario, Canada, are now co-operating with the Public Health Service in releasing its broadcasts by radio. Plans to extend the service to Alaska and Hawaii are under way.

The co-operating stations are operated by newspapers, universities, electrical supply companies and other commercial organizations. These broadcasts after being released by radio are, furthermore, regularly translated into seventeen different tongues by the Foreign Language Information Service and supplied to the foreign language press both in the United States and in Europe. Correspondence in regard to these broadcasts from as far away as Czecho-Slovakia has reached the Public Health Service.

In the first six months of its existence, directly and indirectly it is estimated that this service reached 27,000,000 people in the United States alone

Radio Equipment of the Navy Dirigible "ZR-1"

THE great Navy dirigible "ZR-1," now being completed at Lakehurst, N. J., with which flights to the polar regions are planned, will be as efficiently and completely equipped with radio as is possible. The following preliminary description of this equipment is from official sources:

The main radio set is located in the control car in a sound proof booth. For transmitting a Navy Type SE-1390 transmitter, using six 50-watt tubes and giving CW and ICW signals is used. This set can also be used in connection with the Type SE-1370 transmitter to give a power amplifier transmitting set for telephone work or CW and ICW signals to give steady wave lengths and signals despite any swinging of the antenna that may be caused by "bumpy" air. A reliable range of 400 miles is predicted for the transmitter.

A trailing antenna as at present employed by aircraft is to be used.

The power is supplied by a gas engine-driven generator and 24-volt battery, which drive a motor-generator.

Two receivers are provided, one the Type SE-1950 and 1805 detector and five-stage amplifier as used on F-5-L planes now. The second is a long wave receiver using a radio compass for the antenna. Due to the location of this compass and receiver away from the engines and propeller noises good results are predicted.

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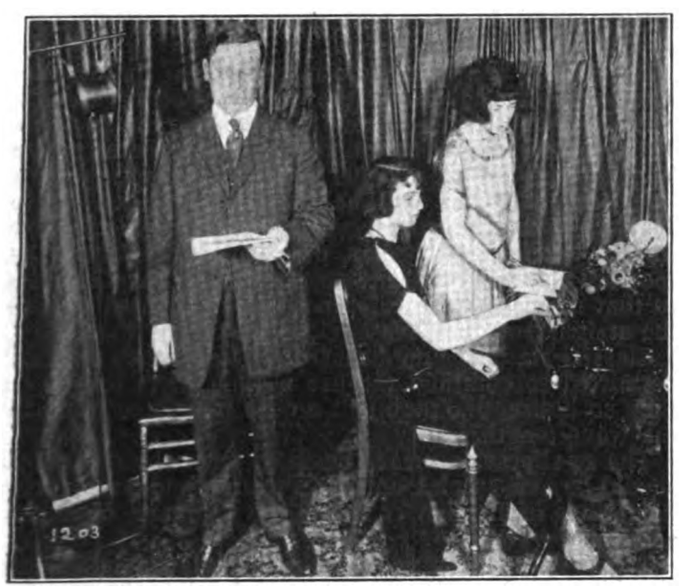
Install Radio in Every American College and School!

Radio World's Plan for Radio School and College Equipment Is Simple and Feasible

THE latent possibilities of radio as a practical, useful and well-nigh universal aid to education are but touched upon in a minor degree in the illustrations herewith depicting the first attempt at radio instruction in a New York City high school.

RADIO WORLD believes and prophesies that the

Radio In The Schools—Sending Instruction To a Distant Class



This picture shows H. W. Leyenberger, a teacher of the Haaren High School, New York City, giving via radio several problems for his class in mathematics to solve in their school room several miles away. Two girl students are checking the results of the problems. The broadcasting was done by Station WJZ at Newark, N. J.

day will come in the not distant future when every building in the great public school system of the United States will be equipped with a radio receiving set for the reception of instruction from central broadcasting stations.

In the larger cities, whose schools are, and will continue to be, crowded beyond capacity and where efficiency will demand every physical aid to instruction, it is not too much to expect that every class room will have its radio receiving set.

The country schools in isolated communities will probably be the first to adopt radio instruction. This will come about because thousands of farmers, whose children must depend upon such schools for their primary education, already are familiar with radio through their ownership of sets by means of which they have been receiving weather and crop reports, market prices and general news. They will not object to a slight increase in the local school tax because the extra money needed for radio equipment will be spent for something with which they are familiar—price and quality, both.

The increase in city school taxes necessary to provide sufficient radio equipment will, of course, be proportionately large, but as far as the individual taxpayer is concerned the added burden may be figured in mills.

Nearly all American universities and colleges can afford to purchase radio equipment—in fact, many of them already are supplied with at least one receiving set. Others can be added as occasion demands.

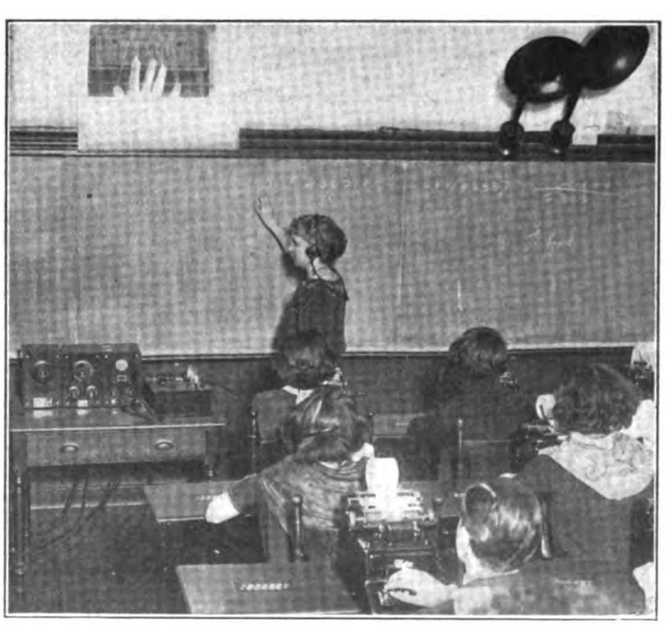
There is no doubt of the success of the idea. The experiment at Haaren High School, New York City, has proven the possibilities, even if that had been necessary.

RADIO WORLD is enthusiastic over the wonderful opportunity here presented to manufacturers and distributors of radio apparatus. An opening is offered such as comes to few young industries. Concerted effort and the consistent following of a well-formed educational plan by which Boards of Education throughout the country may be impelled to favorable action in this important matter are vitally necessary.

RADIO WORLD will assist the industry in every legitimate manner to accomplish the very desirable result of placing a radio set in every public school. If school principals, college presidents or technical instructors will write us their views, we will publish them. The illustrations herewith are almost self-explanatory. They show a class under instruction in adding machine operation, the instructor being located at a central point from which his words might as well be broadcast to a thousand receiving sets as to the one involved in the experiment.

From time to time RADIO WORLD will publish the views of eminent educators on this new phase of radio progress.

Radio In The Schools—Receiving Instruction In a Class Room



Miss Elinore Hastings, of the teaching staff of the Haaren High School, New York City, shown above instructing a class via radio. The questions are transmitted via radio from headquarters of the Board of Education, and the students of the class are then required to solve the problems. Station WJZ, Newark, N. J., is cooperating in these valuable experiments.

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Hoover Approves New Wave Distribution—Much Interference Will be Eliminated by May 15

By Carl H. Butman

WASHINGTON, D. C.—Interference, the bugaboo of both radio operators and fans, will be greatly reduced, if not eliminated, by May 15th. On that date will go into effect the assignment of about 35 exclusive wave lengths to some 30 localities, where Class B, the high-powered broadcasting stations are situated. Wave lengths for Class A stations will also be assigned by districts by May 15, it is hoped.

Although Secretary Hoover is understood to have approved of the tentative allocation of the specific wave lengths to broadcasting stations, it is pointed out that each district radio inspector must now confer with the local operators and owners before the wave lengths are definitely assigned. For this reason the list is not yet made public.

All elements of the radio industry and public promised voluntary cooperation in an effort to eliminate interference especially in broadcasting, and officials of the Department of Commerce point out that it is now literally "up to them" to do so.

The tentative distribution of broadcasting waves is based on the recommendations of the Second National Radio Conference and is the first step in the application of the wave band allocations made recently. It will mean that anyone in the United States with a good receiving set will soon be able to pick up each and every high-powered radio broadcasting station and most of his local stations without experiencing the interference which has been prevalent for many months.

Practically every B station will have a national exclusive wave length, between 300 and 345 or 375 and 545, except where there are two or more in a locality, but the waves are assigned to localities rather than stations and will have to be shared in some cities. In four instances—New York, Philadelphia, Los Angeles and San Francisco—two or three additional wave lengths will also be assigned, but they will not be exclusive nationally. Those waves allocated on the Atlantic Coast will be repeated in the Pacific Coast cities. While not exclusive, these additional waves will aid in supplying additional facilities and will scarcely cause interference as the stations will be about 3,000 miles apart. The difference in time of three hours will also tend to eliminate any interferences. As soon as the nine radio inspectors can arrange with the Class B station owners in their districts, authority to broadcast will be issued on the specified wave lengths and stations will be required to use them only. Where two or more stations exist, a time schedule will be arranged. Until the assignments are made definitely, B stations will continue to operate on 400 meters, and C stations on 360, but by the middle of May it is hoped that all readjustments will be completed and the transfers made. A few radio wave lengths in each district have been reserved because of anticipated interference with other lines of communication or held for new stations.

By May 15 the nine radio inspectors of the department will also undertake the re-allocation of specific waves to old Class A or new Class C stations in their districts now operating on 360 meters. These wave lengths, between 222 and 300 meters, will not be exclusive nationally but will be exclusive in each radio district, giving practically every station a selective wave. Along the borders of adjacent districts, inspectors plan to arrange the allocation of wave lengths so that no material interference will be created due to the assignment of waves in close proximity.

Class C stations now licensed on 360 meters will be permitted to continue the use of this wave length if they so desire, but they will not be permitted to vary the wave length.

The re-allocation means much to fans, any of whom should be able to pick up any B station and any of the A stations in his district due to the allotment of many additional waves.

A great amount of additional work will fall upon the shoulders of the radio inspectors and unless the receiving public, operators and other interests co-operate by staying on wave lengths assigned, the work will be delayed and interferences will not be overcome.

High Speed Radio Transmission in the Army

SUCCESSFUL experiments in high speed radio transmission between Army Message Center and the Munitions Building at Washington, D. C., have just been completed. With new commercial apparatus capable of sending mechanically from a perforated tape up to a speed of 100 words a minute and recording the messages in a saw-toothed ink line on a tape, a reception speed of 65 words a minute has been achieved. After a little practice, Signal Corps experts say, their operators will be able mechanically to copy the received messages visually as well as by ear, and in this way a great saving of time will be made in clearing traffic.

The Signal Corps is planning to adopt high speed systems such as commercial companies are using in transatlantic work for transcontinental messages, and may order new mechanical radio equipment capable of operation at the rate of 200 words a minute. The practical value lies in the fact that when only a few clear hours a day are available, a great number of prepared high speed messages can be sent through in a short time. The transcribing on message blanks can be done after reception by several operators.

An addition to the Army radio net was made in March when the Fort Bragg, N. C., radio station WZG was put in operation. A new 5KW tube set has replaced the single tube set at Fort McPherson, Atlanta, which was not powerful enough to operate over the Appalachian Range. A new station with high powered tube transmitters will be completed at Fort Leavenworth, Kan., in August, and Fort Douglas, Utah, will also soon have new high-powered equipment.

High speed transmitting and receiving apparatus will also be installed between Washington, Fort Leavenworth, and Fort Douglas, and possibly at Fort Sam Houston, Tex. In good winter weather it is expected that Washington can clear traffic to Fort Douglas, Utah, but in the summer it will probably be necessary to relay through Fort Leavenworth, Kan.

The Signal Corps is now assigning waves lying within the bands recently allocated to the Government by Secretary Hoover's conference.

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Coupling As It Affects a Transmitter

By W. S. Thompson, E.E.

IN a previous article the author pointed out very briefly the effect of coupling upon the selectivity of a receiving set and it is now his purpose to show by describing a few experiments how coupling will affect a transmitting set.

In order to give the reader a clearer idea of what the data obtained mean, the following description of the apparatus used is given:

As the object was to study the effects of coupling, a simple transmitting set, as shown in Fig. 1, was hooked up using a 100-volt 60-cycle alternator as a source of power. A quenched spark gap was used in order that damping of the primary circuit would be as

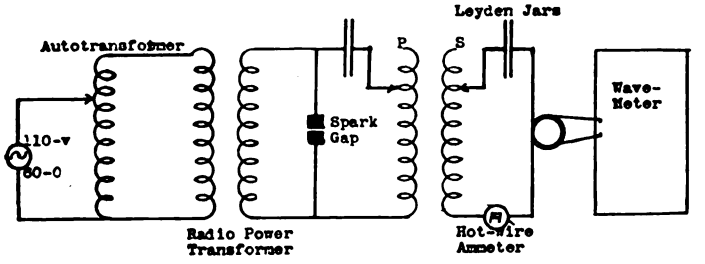

Fig. 1—Hook-up of apparatus used to obtain curves discussed in the accompanying article.

small as possible. The oscillation transformer was made so that the degree of coupling between the primary circuit and the equivalent antenna circuit was variable. The Leyden jars in the secondary circuit are the equivalent of an antenna, so that the circuit is identical with some in use today. In recording data for the curves reproduced, a hot-wire ammeter "A" and a wave-meter were used.

The wave length of the primary circuit was first obtained by using the wave-meter when the set was operated with the antenna circuit open, giving the true

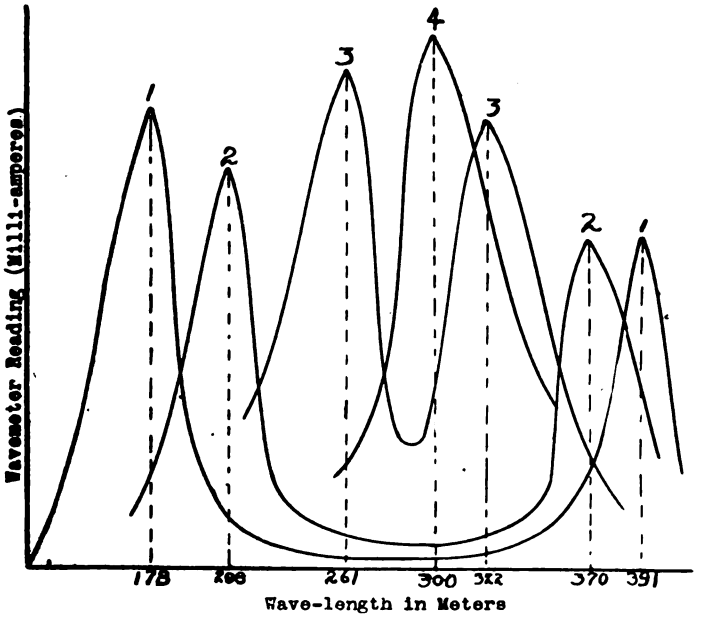

Fig. 2—Energy distribution curve of a transmitter for four degrees of coupling.

wave length of the transmitter. The antenna circuit was then tuned to the primary so that in taking all data, both circuits were tuned to the true wave length of the set.

The first part of this experiment was to obtain data for the energy distribution curves for four different sets of coupling. The purpose of the energy distribution curves are to show how much energy is being radiated from the antenna at different wave lengths. To get the data necessary, the wave-meter coil was coupled to a few turns of wire made in the secondary circuit. With the primary oscillating the wave-meter condenser was turned, taking a series of readings of the current induced in the wave-meter, and the wave length as shown by the condenser. This was repeated for four different settings of the coupling between the primary and secondary circuits.

Fig. 2 gives the energy distribution curves for the different settings of the coupling transformer as plotted from this data. In plotting these curves, distances along the horizontal axis represent different wave lengths to which the wave-meter was tuned and distances along the vertical axis represent readings of the wave-meter milli-ammeter.

Several very striking points are brought out by these curves. Both circuits of the transmitting set were

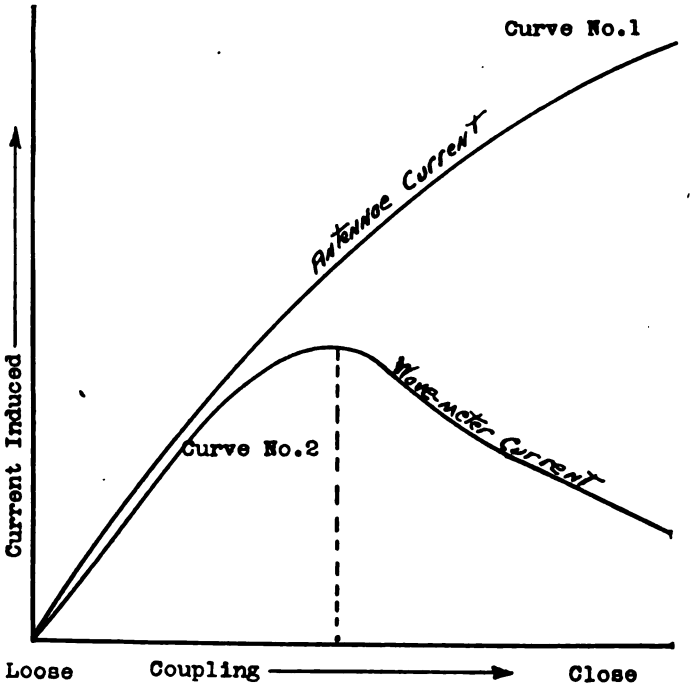

Fig. 3—Curves showing that maximum antenna current does not always mean maximum radiation on the true wave length.

tuned to 300 meters, as shown, but the set radiated maximum energy at 300 meters, only when the antenna circuit was very loosely coupled to the primary. Curves 1, 2 and 3, for which the coupling was close, all show that the antenna was radiating very little energy on 300 meters, but was radiating on two other wave lengths, one below and one above 300 meters. Also, the curves show that the energy radiated on the other wave lengths was less than that radiated on 300 meters when the coupling was loose.

To the amateur who is transmitting these curves ought to show that if he wants the maximum distance from his transmitter and wants a sharp wave, he should have his primary circuit coupled very loosely to his antenna circuit. Whenever a transmitting set is sending with a closely coupled transformer, it is invariably sending on two distinct wave lengths—one so high or

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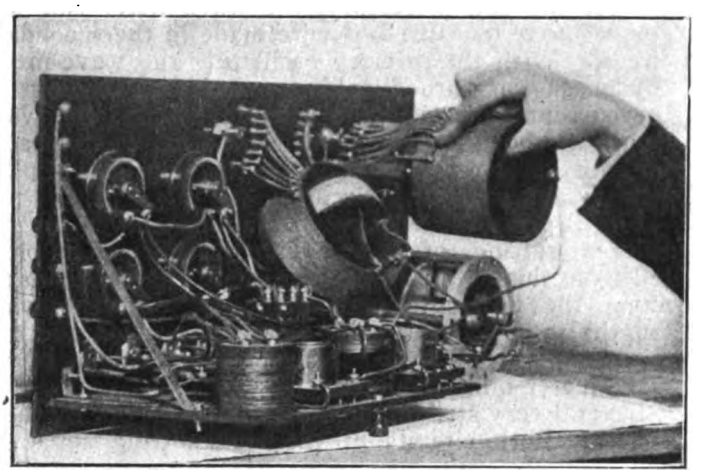
The War Department and the Farmer

THE Secretary of War delivered an address before the American Agricultural Editors' Association, at Washington, D. C., not long ago, of which the following is a partial report:

Rear View of the Kaufman Set



(C. Photonews, N. Y.)

Here is the original Kaufman circuit receiver. It marks somewhat of a departure from regular methods in more ways than one, but the most distinctive thing about it is the "active twenty" coil shown in the upper right of the picture.

In the present period of progress and transformation there is nothing more important for the people of the United States than to gain the frankest, most intimate contact with the departments of their own government. On the other hand, there is nothing which will more certainly produce the necessary support for the departments than to have their activities fully understood by the public. Our public must always rest socially, economically and politically, upon the solid foundation of the farm.

There is no class more vitally concerned than the agricultural with the welfare of our country as a whole—and there is no matter of greater present importance to our country than that of effectively building up our system of national defense. Our present work has, in many fields, continued earlier contacts, and the Departments of Agriculture, Interior, and War now find themselves in routine conference relative to some of the most urgent problems of agricultural development, such as those relating to water power and irrigation.

Because of the isolation of the farm the development of communication facilities is highly important, not only in transmitting weather reports, but also in broadcasting data on markets and in dispensing music and recreational programs to the living-room of the farmer. The prominent part played by the Signal Corps of the Army in building up our system of wired communication is being carried on fully as effectively in the promotion of radio. The Signal Corps is responsible for the use of the vacuum tube in this country, and also largely for the development of the small radio set now used so generally by the amateur. General Squier's recent invention will serve to bring the radio even more generally into the home of the farmer, with the resulting enrichment of agricultural life. In certain sections, such as the early frontiers and present-day Alaska, the farmer has had no communication with the outside world other than that afforded by the Army signal system. The radio web of the Army is today a reserve system that would enable our country to continue its general contacts even in the face of a complete breakdown of the civil lines. The modern farmer will appreciate what this means. He has learned to look upon communication as a primary need instead of as a luxury.

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low that it often interferes with the broadcasting wave lengths. This is an explanation of why code is often picked up around 360 or 400 meters.

In order to show any reader who is sending that he is not always radiating the most energy when his hot-wire ammeter reads maximum, Fig. 3 is given. To get Curves 1 and 2 the coupling was set so that no energy was picked up by the antenna circuit. Then, as the coupling was made closer, readings were taken of the hot-wire ammeter "A" and the milli-ammeter in the wave-meter which was coupled to the antenna circuit. Curve 1 shows the way current, as indicated by the hot-wire ammeter "A," mounted as the coupling was tightened until it was maximum when the circuits were very closely coupled. But the readings of the wave-meter which showed how much energy was being radiated on the true wave length was not maximum when the coupling was very close. The maximum energy was being radiated when the coupling was loose, showing that the maximum reading of the hot-wire ammeter in an antenna circuit does not mean maximum radiation. The explanation of this lies in Fig. 2, which shows that with tight coupling energy is radiated on two wave lengths, neither of which gives a response that can be obtained when all the energy is on one wave length.

The author hopes that this explanation will make some of the readers who are sending, look over their transmitters to see if they are putting all the power of their sets into one wave length. This can very easily be done if a good wave meter can be procured. The following procedure will be found very satisfactory in obtaining maximum radiation on a given wave length. In order to make the explanation clearer, let it be assumed that a reader wishes to send on a 200-meter wave length. The first step will be to disconnect the ground and the antenna and couple the search coil of the wave-meter to the primary circuit. Then set the wave-meter condenser so that its wave length is 200 meters. Set the primary to oscillating and vary the number of turns on the primary inductance coil until the response in the wave-meter is maximum. This will be shown by a large reading of the milli-ammeter or by loudest response in the phones if the wave-meter has no current reading meter. Following this the antenna and ground should be connected and the secondary coupled very loosely to the primary and with the primary oscillating, vary the number of turns in the secondary until the hot-wire ammeter reads a maximum for that setting of the coupling.

The last and most important part of this adjustment is to make two or three turns in the antenna or ground wire as far away from the set as convenient and then to couple these few turns to the wave-meter still set at 200 meters. By changing the coupling between the antenna and the primary circuits, a point will be found where the response in the wave-meter will be maximum. This will be when the coupling is loose and the station owner may then be sure that the set, as it has been made, is giving maximum radiation on the given wave length.

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Broadcasters, What Kind of Talent Do You Want?

Radio Fans, What Kind of Talent Do *You* Want?

Broadcasters, let us know the type of artist and the kind of material you prefer for your programs.

Radio fans, write and tell us the kind of program you like—whether instrumental, music, singing, comedy, recitations, service talks, etc., etc.

These replies will be published in an early issue of RADIO WORLD and the issue containing the wants and desires of broadcasters and radio fans will be specifically called to the attention of musical, vaudeville, dramatic and other talent in New York and throughout the country.

In this way the whole matter will be linked up so that everybody will know what everybody else requires in the important matter of broadcasting.

Broadcasters and fans, write us today and tell us what you want.

EDITOR, RADIO WORLD, 1493 Broadway, New York

See Next Week's Radio World

IS the radiophone industry about to be revolutionized?

Does the day approach when a radio receiver can be connected to an electric lighting fixture, as an electric fan is now attached?

RADIO WORLD will publish in its next issue a provocative article on a device which may be the entering wedge to radio possibilities now considered merely dreams.

Well Constructed Amateur Set Made by J. C. Gorman

(C. Photonews, N. Y.)

The radiophone station of J. C. Gorman, New York amateur, who has been heard a distance of 1,100 miles on phone and over 1,500 on CW. The transmitter is located on the left of the table, while the receiver is at the right. The receiver employs two steps of radio frequency and detector. Either one or two stages of audio-frequency can be used.

"Secret Radio" as an Aid to Naval Intelligence

DURING the recent cruise of the United States fleet for maneuvers off Panama, Secretary of the Navy Denby and members of the Congressional party with the fleet were intensely interested in an address by Captain Luke McNamee, chief of the Office of Naval Intelligence, on the subject of blunders in the World War due to misinformation supplied by intelligence agents.

Captain McNamee, who was stationed in London during the war on service in the War Planning Section, also dealt with some of the achievemtns of the British Navy as a result of accurate naval intelligence, and told of the early acquisition and dissemination of information which resulted in prompt measures by the British Navy in connection with the battle of Dogger Bank.

After a review of what had actually been done in the way of naval and military intelligence during the World War, Captain McNamee hinted at the possible use of "secret radio" in the next war—the sending of radio messages secretly in such manner that they might be picked up by the sender's own fleet, but remain a secret to the enemy.

"I am not speaking of what is desirable theoretically," said Captain McNamee, to the New York Times correspondent, "but of what was actually done in the World War, and we can be sure that all that is capable of vast improvement today. It may be that the one chief source of information, the radio, will in the next great war be entirely lost to us. Secret radio is well within the possibilities. The advantage of exclusive possession of such apparatus needs no comment.

"For combat information preceding and during a naval action the Commander-in-Chief will be largely at the mercy of his intelligence service. He may know in a general way the enemy's strength in the theatre of war and his possible intentions, but he will on the eve of action find the situation becoming hourly more confused by conflicting information—reports of enemy forces sighted by aircraft, by auxiliaries, by neutrals; false reports broadcast by the enemy, some of which will purport to come from his own ships.

"Amid all this confusion there must sit near the Admiral an intelligence staff that can winnow the wheat from the chaff. Expert radio men may know the wave lengths, the tune, the idiosyncracies and touch of the enemy's operators. This sounds impossible, yet it is the very thing that British operators did in the war. It was useless for the Germans to change call letters or exchange them between ships as long as the operators remained the same. They were spotted at once. The Oldenberg could not palm herself off as the Derflinger. The enemy's codes must be known, and, if not known, broken. Direction-finders will give the key to the probable source of dispatches.

"In the absence of aircraft a knowledge of the enemy's radio may enable direction-finders in the fleet to get an intersection on important vessels of the enemy main body that will at least give a clue to his location and course.

"In the German fleet certain ships were detailed to handle the traffic in groups. This facilitated the business of the fleet, but made it easier for the British intelligence service, who by listening only to the traffic ship, could catch all the messages of the group. The grouping for traffic also indicated what ships were together."

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Westinghouse Cuts Out Broadcasting Copyrighted Music

RESPONDING to a demand of the American Society of Composers, Authors and Publishers relative to broadcasting copyrighted music, the Westinghouse Electric and Manufacturing Company announced last week that copyrighted music will no longer be sent out from its stations. The first step was taken when WJZ cut the opera, "Robin Hood," from its program.

In a statement the Westinghouse Company said that after a careful study of the subject it had decided to eliminate from its future programs all copyrighted music the copyright of which is owned or controlled by the American Society of Composers. Except for the elimination of certain copyrighted music, it will continue its broadcasting activities as heretofore.

How Broadcasters Can Beat the Music Publisher

THERE has been a lot of talk in recent weeks regarding the claims made by music publishers and various associations of authors and composers as to the very drastic attitude they intended to take regarding the broadcasting of their operatic, musical comedy or fugitive song numbers. They say they should be paid for the use of their material when broadcast just as they are paid by the phonograph companies.

Let us assume for a moment that we are running a broadcasting station. We receive nothing directly from this service. We do not want to be penalized for broadcasting songs and instrumental pieces which not so long ago the music publishers were dying to have everybody use, and in some cases paid handsome weekly or lump sums to vaudeville singers and other musicians for using. As broadcasters we know we are offering a great public service to radio and the public at large, and feel that the fees demanded should not be paid.

Supposing, however, that a fair argument does not bring the publishers to terms, what then can be done? The answer is simple. Every music publisher is obliged to boost his numbers so that singers will put them in their repertoire, phonograph companies will record them, and eventually the public will buy them.

Broadcasters can adopt practically the same method. Good song writers—and some of the most popular and successful in the business—can be engaged on a salary or royalty basis and if their output is released through all the other broadcasting stations there would soon be such a demand for these numbers that the music dealers throughout the country would be placing their orders for hundreds of thousands, and, in some cases, millions of copies. These new numbers could also be released through singers, orchestras, etc., and practically the same method of boosting procedure adopted as is now used by the biggest music publishers.

Broadcasters should not worry at all when it comes to a matter of getting up-to-date material. They can make their own. They can popularize it in a more expeditious and thorough way than was ever known in the old days of "song-plugging." All they have to do is to adopt the methods of their friendly enemy and go right into the song and instrumental sheet music business themselves in the manner indicated.

Who will be the first to put over this very practical plan?

Radio Penetrates Bank Vault

(C. International Newsreel)

Officials of the Stratford, Conn., Trust Company demonstrating that steel vaults, concrete casings and electric protective wiring are insufficient to keep radio waves from entering a vault. Under an official test, station WJZ at Newark, N. J., was clearly heard by the bank officials in the vault.

Germans Pay for Broadcasting

IN Germany radio fans, most of whom are bankers and business men, have to pay 500,000 marks annually for their radio broadcast service.

A financial and commercial news service has been arranged for broadcasting by the Express Service Company of Berlin, according to information reaching Washington. This private company, financed by Germans, has just secured partial use of the Koenigswusterhausen radio station from the Government for broadcasting international news received via Nauen from the United States, Switzerland, Sweden and other countries.

The news is rebroadcast over a radio phone circuit for about 800 subscribers, principally banks and industrial institutions, in about 200 cities. The company plans to handle New York quotations within ten minutes after their dispatch from this country and more rapidly, when possible.

Subscribers rent their receiving sets from the Express Company, paying an annual rental charge of 200,000 marks and an annual service charge of 300,000 marks. Two and a half hour schedules are maintained every morning and evening.

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The Radio Primer

For Thousands of Beginners Who Are Coming Into Radio Circles

Weekly A B C of Radio Facts and Principles Fully and Clearly Explained

By Lynn Brooks

A LICENSE is necessary to operate a transmitter. What method should be pursued by the layman in order to obtain one?

A knowledge of the code is necessary. In order to learn the code, the simplest method is often the best. To do this, equip yourself with a buzzer, key and battery and practice sending dots, which is accomplished by holding the key down for a very short space of time. Practice this until the wrist is perfectly limber. In sending, the arm should not rest on the table, but be held a short distance above, and the key manipulated by moving the hand and wrist in an up and down motion. When dots can be sent quickly and evenly practice sending dashes, which are three times as long as a dot. Then with the code in front of you, practice sending the letter "A," which is a dot and a dash. Practice until it can be sent easily and distinguishably. Then go to "B," which is a dash and three dots. Do this with the entire code until each letter of the alphabet can easily be sent. Then try to work individual letters, picked up at random. When your wrist is limbered up and will respond easily, go through the code and memorize it in the same way, by sending the entire code, each letter once or twice. If an error is made in a letter, stop and practice the particular letter until it is perfect. Don't try to speed up, but send easily and slowly, making each letter perfect. Speed will come later, with greater familiarity with the code itself.

* * *

What are the "Q" signals?

The Q signals are a list of abbreviations, adopted by the International Radio Convention, at Geneva, Switzerland, to enable transmitting stations to give information and ask questions with the least amount of time and energy. They are three-letter codes which, if a query is sent after them, mean the question; whereas, if they are sent without the query, the answer to the question is meant.

* * *

Is any extended technical knowledge required in order to obtain a license?

The technical requirements necessary are a thorough knowledge of the type of receiver you are using and a schematic diagram for it. A knowledge of the transmitter that is to be used, such as the power required, out-put of transmitter, the name of the parts, their purpose in the set, the wave length of the antenna used, and a diagram of it are also necessary.

* * *

Into what classes are licenses divided?

Radio licenses are divided into two classes—amateur and commercial. The amateur class is again divided into first, second and third class. The operating license is then sub-divided into first, second and third grade, dependent upon the speed of reception and transmission of signals. The commercial operator's license is divided in the same manner.

* * *

Can a license be obtained when a person is not able to go to the custom house in person?

In case a person desires a license, yet is so situated that he cannot conveniently take a personal examination because of living at a distance from one of the naval stations or custom houses, he is at liberty to write to the nearest one, requesting the papers. By filling them out and swearing to them before a local notary, as to his operation of a transmitter, and the answers to the questions, he will be allowed the privilege of a license if the papers are satisfactorily filled out.

* * *

When a storage cell has been left standing for any length of time, what should be done before it is returned to use?

In case a storage cell has been left any appreciable length of time without charging the following action should be taken if the cell is to be saved: The electrolyte should be poured out, the cell filled with clean distilled water and placed on charge. Then the cell should be discharged for a short time and the distilled water removed. Clean new electrolyte should now be placed in the cell. Then the normal charge is put on and the cell slightly overcharged. Examine the bottom of the electrolyte by means of a glass tube in the following manner: Take a clean glass tube, open at both ends, and of sufficient diameter to insert in the end of the cell. Lower it carefully to the bottom of the cell and close the top by putting the finger over it. If when the tube is taken out the sample of the electrolyte withdrawn in the tube is muddy and filled with slime, the whole cell should be thoroughly cleaned.

Voice Amplifier Directs Passengers to Boston Elevated Cars

(C. Western Electric Co.)

Mayor James Curley, of Boston, using the microphone of the Western Electric public address system to amplify announcements on the Boston Elevated Railway at Park Street Station.

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Radio and the Woman

By Crystal D. Tector

FRIEND HUSBAND and I went over to the new radio apartments in Newark, N. J., the other evening just for a lark, to see if it was fun having anybody else tune in stations for you while you listen. I think it is a good idea, and if we ever decide to move to the city (F. H. decides that every time he has to mow the lawn) I shall insist that we move into an apartment that at least has antennae equipment installed for every apartment. As it is now, the operator in the Newark apartment has to be a diplomat, there are so many different programs going on. It really is hard to tune in the right one. Even if you do like jazz, you have to consider that the people downstairs may like to listen to the lecture on "Elephoyn Eucalyptus—Its Origin and Habitat," and he certainly must exercise care. I think that if I were an operator I would make a canvass of the families and find out how many liked opera and how many liked jazz, and then I could divide the program to suit every body, even the little flappers and their visiting flippers.

* * *

Convincing proof of the value of broadcast religious services was received by WGY, the Schenectady broadcasting station of the General Electric Company from a blind woman living in East Orleans, Mass., near Cape Cod. The paper was creased under each line of writing and it was evident that the creased line was used by the writer to guide her pencil as she wrote the following appreciation: "I am writing you a few lines this beautiful morning to tell you how much I enjoyed your good sermon Sunday afternoon, also the singing of 'Just as I Am,' and others. I heard every word of the sermon and singing, which was fine. I could hear just as plain as though you were in the room.

"What a wonderful invention! A friend and kind neighbor took me to his house to hear the radio. I am an old woman, almost 75 years old. Have been stone blind over twelve years, have not seen one ray of light. I take care of a crippled husband who is over 80; cannot walk a step alone. I dress and undress him every day and wait on him. Sometimes the way seems dark, but my dear Heavenly Father gives me strength every day, and at night I say I am a day nearer home. I go to church or Sunday School and do enjoy it so much. I gave myself into God's hands over 50 years ago and He has never failed me yet. I always trust Him. He knows what is best for me. Pardon me for writing, but I did want to thank you for that service. May God bless you, is the prayer of your friend.

"P. S.—It is one of the most wonderful of all inventions to know that I can sit here in an easy chair way down on old Cape Cod and hear such lovely sermons and singing. God bless the man that invented it. I hope to hear you again some time."

* * *

'Member some time ago, I told everybody about my little friend up in the North Woods who appreciated radio so much? Well, I just received a letter, telling us that her father had "taken on" as a guide to a party of hunters who were spending the spring up there, and had brought along little receiving sets which could be carried by each man, and that they installed a small transmitter "right in our cabin" and that the man left in charge taught her the code. She says: "When the party broke up, you can imagine our surprise when the host of the party told them to leave the transmitter there and also one of the small receivers, so that I could keep in touch with daddy. Well, I am going to write for a license right away, so that I can use it." Now there is a novel idea for you Nimrods when you go camping this summer. Take along your receivers and make up small low power battery operated transmitters, and you'll never get lost.

Radiograms

Communication by means of radio telephony has been established between Sao Paulo and Rio de Janeiro, Brazil.

* * *

Plans are being discussed by city officials to institute wireless concerts on the municipal passenger boats of Paris, France.

* * *

Station WGR, of the Federal Telephone & Telegraph Company, will be moved to the new Hotel Statler, Buffalo, N. Y., now nearing completion.

* * *

Radio broadcasting from the Brazilian Centennial Exposition at Rio de Janeiro was heard last week by one of the United States Government stations at Honolulu, 8,000 miles away, establishing a new distance record.

* * *

An 11 per cent. wage raise for 150,000 employees of the United States Steel Corporation was ordered by radio last week by Judge Elbert H. Gary, chairman of the Board, who was at sea on his return from a Mediterranean trip.

* * *

Clarence M. Jones, composer of the popular "Trot Along," has just made a record of this number at the Rodeheaver Studio, Chicago. It is reported that several record companies are already bidding for the master record, so an early release of this number is expected.

* * *

A request to the Mayor of New York City for the installation of radio receiving apparatus on each of the Staten Island ferryboats to enable the passengers to enjoy the program broadcast on their half-hour trips to and from Staten Island has been made by a Staten Island schoolboy.

A musical concert at a radio broadcasting station in Boston was halted one evening last week while the announcer told of the death of a boy, run over by an automobile, in the hope that the news might reach his father aboard a fuel steamer in Chesapeake Bay.

* * *

Alan Edwards, who devotes his time to electricity and wireless when he is not playing the role of the rich young man in "The Gingham Girl," at the Earl Carroll Theatre, New York City, has just been granted a patent for a new portable radio outfit for which he has already received many orders.

* * *

WHAZ, Rensselaer Polytechnic Institute, Troy, N. Y., is claimed to be the most efficient and far-reaching station in any educational institution in this country, and its range extends from coast to coast, from Alaska to Panama, the Pacific islands and West Indies, according to reports direct from receivers.

* * *

Charles L. Eidlitz, head of Charles L. Eidlitz & Co., electrical manufacturers and contractors, New York City, has been appointed High Commissioner over two associations of electrical contractors comprising 300 members in Manhattan, Brooklyn and Queens, doing an annual business of between $40,000,000 and $60,000,000. Mr. Eidlitz, who entered upon his new activities last week, will have authority to reorganize local contracting methods. He will have nothing to do with labor.

* * *

When you step into one of the gorgeously appointed limousine-body airplanes being prepared by the Laird Airplane Company for passenger service between Kansas City and Wichita, Kansas, you will see a complete radio receiving set which has been installed for your pleasure and entertainment. This radio receiver is the Crosley Model VI, which, under favorable weather conditions, will permit you to listen to the music being broadcast by the large radio stations throughout the United States.

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Answers to Readers of Radio World

I CONSTRUCTED the Flewelling described in RADIO WORLD *for February 24, and, while it worked fine on local stations, it does not bring in the DX stations as clear and loud as I would like. I am using the following apparatus: Freshman grid leaks and condensers, Bradleystat and honeycomb coils. The set whistles very loud when I try to bring them in. A WD-11 is used, with 67½ volts on the plate. Would a WD-11 function with a single-circuit receiver using the same apparatus?—Harry E. Halldeman, care of Keystone Fruit Co., Cincinnati, Ohio.*

We would advise the following: If possible use a 201 U. V. with this set, as it has been found that it will function better than the WD-11 because of the increased plate surface and greater spacing between the elements. In order to decrease the whistle (it cannot be entirely eliminated without seriously impairing the circuit's work) you will have to vary your grid leak, both in the grid circuit and also in the filament condenser bank. This whistle can be brought to such a high pitch that it is almost indistinguishable to the human ear, and at that point it is very weak. Incidentally, this is the point at which the circuit works best, and the distant stations will pound in. The apparatus you are using can be employed for a single-circuit set, using the 50 as the tickler and the 75 as the primary coil.

* * *

I constructed the improved WD-11 receiver illustrated by C. White, using the apparatus mentioned, and get local work very fine, but with a lot of whistling and hissing. I have the rotor of the condenser C1 connected to aerial and stator to the grid. The condenser C2 has the rotor connected to grid and stator to the plate lead. Is this correct? Will it be practical to use one or two steps of A. F. amplification with this or any standard hook-up?—C. J. Wehmayer, 394 Penrose Street, St. Louis, Mo.

The condenser C1 should be connected between the antenna and the beginning of the first or primary coil of the tuner. The second condenser should be connected across the near ends of both coils. It should not make much difference in a single circuit which side of the condenser is connected. Would advise the use of a potentiometer in the filament-plate battery lead. Try connecting the grid leak between the gride side of the condenser to the minus side of the filament circuit. Try increasing the capacity of the grid condenser by placing another fixed (small size—.00025 mfd.) condenser in parallel with the grid condenser you are now using. If you desire to increase the strength of the received signals it is perfectly advisable to incorporate one or two steps of audio-frequency amplification. Audio-frequency, as you probably understand, will only allow you to amplify signals that you can receive on detector alone.

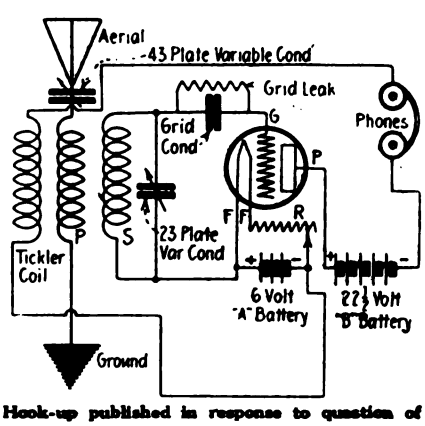
* * *

Kindly give me instructions for the construction of the transformers used in the Haseltine neutrodyne receivers. What is the capacity of the neutralizing condensers used? Where can blueprints for the construction of such a set be obtained? Can ordinary radio-frequency transformers be used in this circuit? What is the range of such a receiver, and what plate voltage should be used?—Emil R. Entress, 83 Main Street, Hackensack, N. J.; F. E. Roberts, Fountain and Dean Streets, Providence, R. I.; J. Scouten, Fall River, Mass.; C. R. Mason, P. O., General Delivery, Liberty, N. Y.; F. S. Meyer, St. Louis, Mo.; R. L. Alexander, Pawtucket, R. I.; J. K. Hines, San Antonio, Texas.

To these, and many other anxious readers, RADIO WORLD wishes to state that all the information that can be obtained was printed in our article on the Hazeltine neutrodyne circuit receiver in RADIO WORLD for March 31. This is a patented circuit, and such details as the construction of the radio-frequency transformers and the neutralizing capacities cannot be published at the present time.

* * *

Kindly publish a hook-up using the following apparatus: Three honeycomb coils, detector, bulb, phones, batteries and necessary condensers.—M. L. Ronecto, 113 Vine Street, Pittsburgh, Pa.



Hook-up published in response to question of M. L. Ronecto. The different parts are all properly marked.

The hook-up you desire is published herewith.

* * *

Where can pictures and blueprints of the Lighthouse receiver be obtained?—J. Thurriault, 20 Broadway, Cohoes, N. Y.

Write to C. W. Tupper, Bureau of Lighthouses, Washington, D. C., and you will be advised of their cost. They will be sent to you on receipt of the price.

* * *

Have constructed the Sorenson hook-up as described in RADIO WORLD *for January 20, but I cannot get any oscillation or regeneration. I have checked the hook-up over thoroughly, but cannot find what is wrong.—C. C. Huntington, Mauch Chunk, Pa.*

Reverse the connections on your 75-turn tickler coil. Use a small fixed condenser across the B and phone leads. Connect the B lead to the opposite side of the filament circuit from that shown in the circuit.

* * *

In RADIO WORLD *for November 25, 1922, you published a circuit by J. Schuck. What is the size of wire and number of turns used on each side of the rotor? What is the size of wire and number of turns on each side of the stator? What is the inside diameter of the stator and clearance of stator and rotor?—C. C. Powers, 403 West 33d Street, Richmond, Va.*

In regard to this hook-up it may be said that any manufactured variometer will work satisfactorily and does not have to be made. However, for your own information 20 turns of No. 18 or 20 wire on each side of the rotor will do. About 16 to 18 turns of the same size wire on the stator is O. K. Variometers are generally made with a 2½ or 3 inch rotor; therefore the stator diameter will be about 3½ or 3¾ inches to work satisfactorily, although this will be a little close.

* * *

Can I use a U. V. detector tube in the Flewelling circuit? Can spider-web coils be used with this set instead of the honeycomb coils?—Oliver Carmer, 1517 Franklin Avenue, Fort Wayne, Ind.

The tube you mention is perfectly O. K., and you can also incorporate spider-web coils in this circuit.

* * *

Should grid leaks be used in the hook-ups published in RADIO WORLD *for March 10 on page 20, and what is the capacity of the condenser used?—R. W. Kirkpatrick, Anderson, S. C.*

These hook-ups will work without grid leaks but it will improve the selectivity if a grid leak is used on the last one. The variable condenser should be .001.

* * *

Where can I obtain a hook-up embodying the following: One step of radio-frequency, detector and one of audio, with the regular three-circuit regenerative receiver?—J. K. Eisenberg, Jauney & Co., 133 So. Fourth Street, Philadelphia, Pa.

We refer you to the diagram published on page 19 of RADIO WORLD for February 24, where you will find what you desire.

* * *

Kindly publish wiring diagram of two step amplifier for the long wave receiver published in RADIO WORLD *for June 24, 1922, utilizing the new 201 A amplifier tubes. —Henry Zube, 1311 16th Street, Lorain, Ohio.*

If you will refer to page 26 of RADIO WORLD for March 31, 1923, you will find the hook-up you desire. The grid leak can be omitted for the receiver you mention.

* * *

What is the U. V. 201A tube? What plate voltage is used on it? What is the price, and where can it be obtained?—A. J. Howe, R. F. D. 7, Mason, Mich.

We refer you to RADIO WORLD for March 24, 1923, where you will find a complete description of this new tube in an article by J. L. Bernard on page 8. This tube is obtainable in any up-to-date radio supply house. The list price is $6.50.

* * *

Am enclosing a sketch of my receiver, and wish some advice on same. When I tune in a station I have much trouble, because my circuit oscillates so violently that the voice is all muffled. I am using the best apparatus obtainable, and only use 22 volts on the plate. Would the set work without the variometer in the plate circuit? —L. L. Hamilton, Topsham, Me.

Put a potentiometer in the filament circuit of the first tube. Allow more space between the two variometers and the vario-coupler. You have them too crowded. Try bridging the grid leak between the grid side of the condenser and the negative side of the filament circuit. This might help. The set would work without this variometer, but it would make it harder to obtain regeneration without it.

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REALM OF RADIO RELE
REPRODUCT

(C. Fotograms, N. Y.)
Rather than spend time "below decks" in the submarine, these members of the crew of the S-50 bring their speaker up on deck and let the operator "stay below" to tune them in on a good program from some distant station.

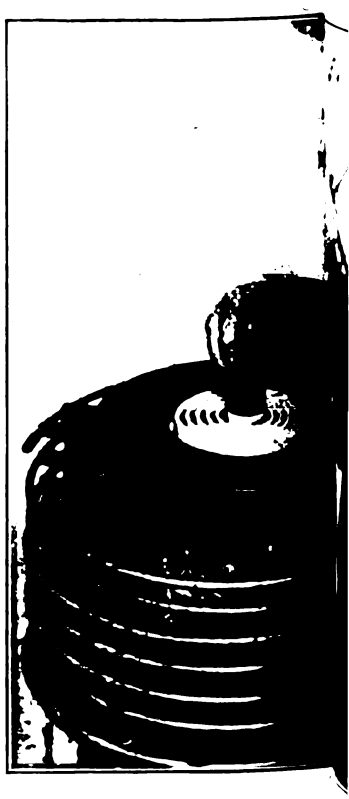
(C. Keystone View Co.)
Mr. and Mrs. Cornelius Vanderbilt, Jr., enjoying a second honeymoon amidst the sunshine and flowers of California, spend pleasant hours listening to the interesting programs emanating from KFI.

(C. International Newsreel Photo)
Brother Nate intends to at least be able to listen in to the broadcast of the baseball games this summer, after the usual number of grandmothers die off. He therefore made his last summer's "kelly" into a receiver. The antenna is an umbrella, wound with insulated wire inside its shady roof, and the whole set didn't cost but fifty cents for the switchpoints and knobs. The wire for the tuner is wound under the band of the hat.

(C. International Newsreel)
Assistant Secretary of the Navy Roosevelt broadcasting through Station WJZ on the needs of the thousands of war veterans. By this means he was able to reach thousands of people with a more personal touch than can be had by talking through the daily papers.

(C. Metro Pictures)
Bull Montana recently got acquainted with a radio receiver, and after the instinct of the bug once it starts working, he wanted to know "what made the wheels go round" with the result pictured. It's easy to break, but——

(C. Kadel and Herbert)
Fort George Presbyterian Church, New York City, not having either organ or chimes, recourse was had to receiving the music and chimes broadcast from the local stations in New York and Newark, N. J.



(C. Photonews, N. Y.)
Old-time spark gap with muffler a shore stations in the early days—an gatherer" with the neat and

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OF RADIO RELEASES REALISTIC REPRODUCTIONS

ng a second honeymoon
end pleasant hours lis-
ting from KFI.

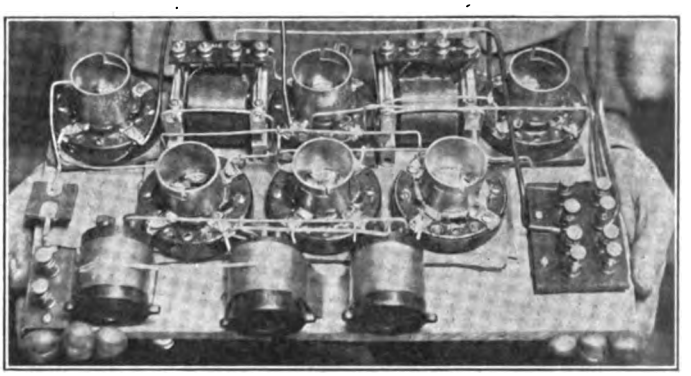
(C. Underwood and Underwood)
George Robey, of Covent Garden Theatre, London, England, recently made a receiving set so small that an ordinary matchbox is a gigantic thing when compared with it.

(C. Kadel and Herbert)
Tolling the knell of the hand organ. This radio hurdy-gurdy recently appeared in London and created quite a stir in hurdy-gurdy circles. A complete four-tube set is mounted inside the wagon, working on the small antenna, with a loud speaker on the far side. "'Ow's a feller goin' ter make a bob with that blighty thing a-tootin,' I arska you?" Is what the old timers are saying.

International News
istant Secretary o
vy Roosevelt broadcast
ough Station WJZ a
ds of the thousands
veterans. By this me
was able to reach m
ds of people with a
sonal touch than as
by talking through
daily papers.

Captions by
ROBERT L. DOUGHERTY

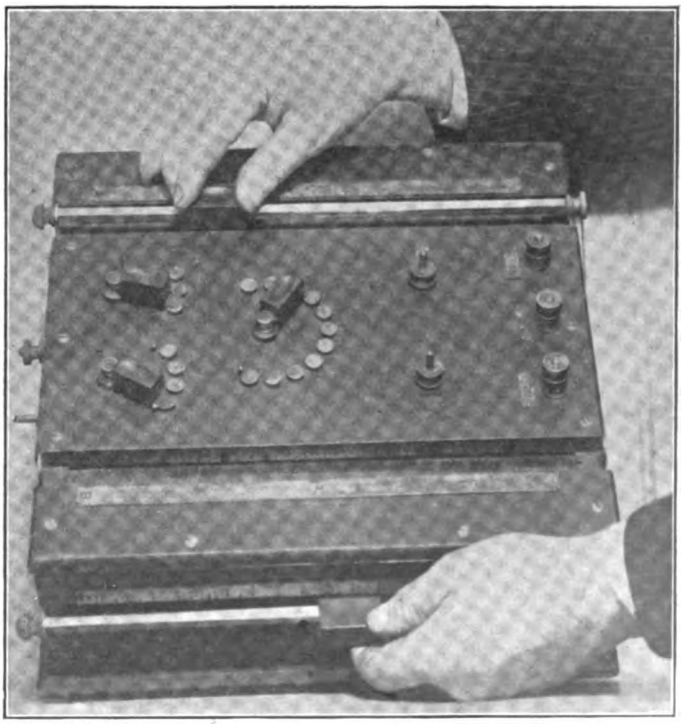
(C. Wide World Photos)
Born deaf, Leo Koehn, of Detroit, Mich., was made to hear through the agency of a radio receiving set with a power amplifier. A doctor made this experiment, after hearing of the success of a similar one on the continent.



(C. Kadel and Herbert)
Here's the type of set they use in England when they want to hear WJZ or WOR. It is three stages of radio-frequency, detector and two stages of audio-frequency. American sockets and transformers are used.

Photonews, N. Y.
helix as used aboard ship and in
1906. Contrast this bulky "dust
ident apparatus of today.

(C. P. and A. Photos)
Mr. John Osborn, well known Philadelphian, created quite a furore when he appeared on the bridlepath in Fairmount Park with a complete portable radio set on his back. It works on a loop and gives him lots of pleasure while out for a brisk ride in the mornings.



(C. Photonews)
Numbered among the antiquities is this old United Wireless three-slide tuner used in the Navy in the year 1906.

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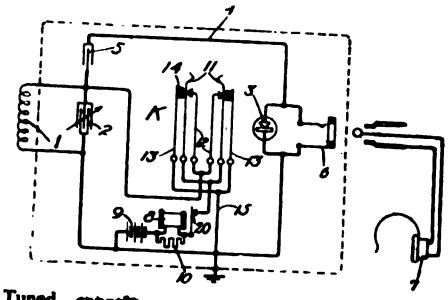
Latest Radio Patents

Wave Meter and Similar Electrical Devices

No. 1,448,579: Patented March 13, 1923. Patentee: George H. Stevenson, Rye, N. Y.

THE invention relates to wave meters and similar electrical apparatus, and more particularly, to means whereby the frequency calibration of such apparatus will not be rendered incorrect by the opening or closing of a key connected to the circuits of the apparatus.

It is customary in the arts dealing with high-frequency currents when wave lengths are to be measured or compared, to make use of a wave meter which for some purposes consists of a simple tuned receiver and detector for high-frequency waves and for other purposes consists of a low power generator. The usual manner of changing the apparatus to form a local generator is to include in circuit a buzzer or self-interrupting electromagnet which causes the tuned circuit of the wave meter to be excitd at its resonant frequency. It has been found that the key which serves to connect the buzzer into the circuit has a capacity between its contact blades of sufficient magnitude to cause the wave length calibration which is correct with the key opened to be incorrect when the key is closed or vice versa. This happens because the effective capacity of the key blades is in shunt with the tuning condenser of the tuned circuit when the key is opened. This capacity, in a particular instance, is of the order of 10×10^{-13} farads. A capacity of this magnitude produces appreciable effects at radio frequencies. By placing additional insulated blades on the key and connecting these additional blades in circuit so that when the key is closed their capacity will be substituted for the effective capacity introduced by the contact blades when the key is opened, the calibration may be made correct for either operative condition of the apparatus.

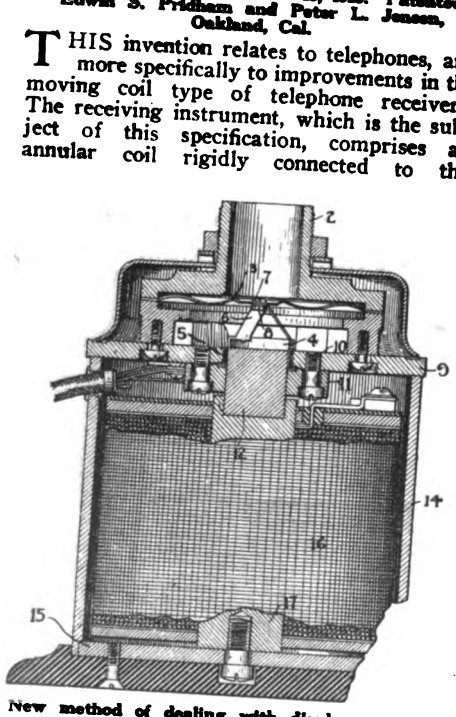


Tuned capacity wave meter, making more accurate readings possible.

Electrodynamic Receiver

No. 1,448,279: Patented March 13, 1923. Patentees: Edwin S. Pridham and Peter L. Jensen, Oakland, Cal.

THIS invention relates to telephones, and more specifically to improvements in the moving coil type of telephone receivers. The receiving instrument, which is the subject of this specification, comprises an annular coil rigidly connected to the diaphragm. This coil is disposed, so as to be freely movable, in a strong concentric magnetic field, produced either by a permanent or an electromagnet. The magnetic field is so arranged that the lines of force cut the annular coil at all points in the same direction. This is accomplished by having one of the poles of the magnet within the coil and the other completely surrounding it.



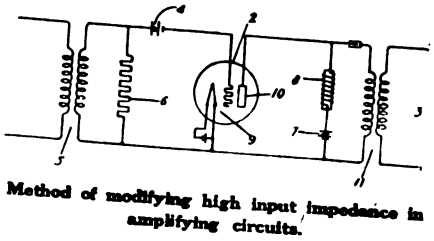
New method of dealing with diaphragm and electromagnets in telephones and loud speakers.

Thermionic Amplifier Circuits

No. 1,448,550: Patented March 13, 1923. Patentee: Harold D. Arnold, Maplewood, N. J.

THE invention relates to repeater circuits wherein an electron-discharge device is employed for receiving comparatively weak incoming impulses and for transmitting them in the same form or in a modified form, but with amplified energy. Such an amplifier, which has a cathode, an anode and a control member, usually in the form of a grid electrode, has a very high impedance between control member and cathode, which are the usual input electrodes. This impedance is of the order of 25,000 ohms or more, being in the nature of a space discharge path between electrodes in a vacuum. Preferably, the vacuum is as perfect as practicable, substantially no positive ionization taking place during the operation of the device. In case a source of potential is employed for making the potential of the grid always negative, the input circuit impedance is of the order of infinity, for no electrons can flow from the filament to an electrode which is negative, so that no current flow takes place between cathode and grid, even though the latter does respond to the incoming potential variations.

An object of the present invention is to modify the effect of this high input impedance so that it may have any desired finite value.



Method of modifying high input impedance in amplifying circuits.

Signaling System

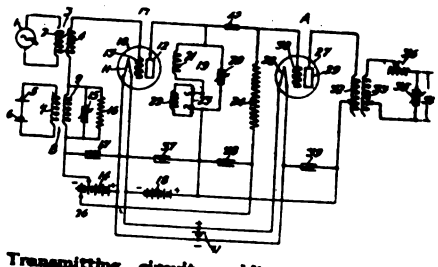
No. 1,448,216: Patented March 13, 1923. Patentee: Raymond A. Heising, Millburn, N. J.

THIS invention relates to signaling systems, and more particularly to signaling systems of the type in which high-frequency oscillations are modulated in accordance with signals.

An object of the invention is to provide a modulating and amplifying arrangement of the vacuum tube type in which the number of necessary current sources may be small.

Another object of the invention is to provide means to enable vacuum tubes arranged in cascade to be supplied from common sources of electrical energy.

A further object of the invention is to provide a circuit connection for a vacuum tube modulator and vacuum tube amplifier which will permit the use of common sources of energy for filament heating, space current and impedance controlling purposes.



Transmitting circuit enabling a number of tubes to be arranged in cascade.

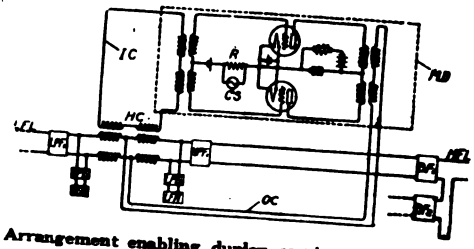
Still other features of the invention relate to certain combinations and arrangements of circuits hereinafter described and particularly pointed out in the claims, the advantages of which will be apparent to those skilled in the art.

* * *

Duplex Carrier Wave System

No. 1,448,488: Patented March 13, 1923. Patentee: Jacob S. Jammer, New York City

THIS invention relates in general to duplex transmission or signaling systems, and more particularly to carrier current telephone systems. The principles of the invention are more particularly adapted for application in systems employing conductive circuits throughout, but may be applied in systems in which the high frequency transmission is carried on through the natural media.



Arrangement enabling duplex carrier wave transmission.

An object of the invention is to provide systems of the type wherein a single apparatus is used to modulate waves passing in one direction and to detect waves passing in the other direction with improved line balancing impedance means. Individual means are provided for balancing the high frequency line separately for each carrier frequency. Since, with carrier currents of the frequencies ordinarily used, a high frequency line often varies considerably and irregularly in impedance for the various frequencies it is of considerable advantage to balance the line separately.

A further object is to provide means in connection with the modulator-detector for compensating for the attenuation produced in the circuit by the various apparatus.

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The WD-11 Vacuum Tube

By G. Y. Allen

Radio Engineer, Westinghouse Electric & Mfg. Co.

CONSIDERABLE misinformation has been circulated from time to time on radio apparatus, its construction, use and application. This is particularly true in the case of the WD-11 vacuum tube, the most popular tube on the market today, possessing characteristics attractive to the average user, as it permits the use of a radio set in places remote from storage battery charging facilities such as the isolated farm, the seashore, the summer camp, the small yacht and other places too numerous to mention.

Let it be said in all fairness that the WD-11 vacuum tube was not the first vacuum tube designed for dry battery operation. It remained for the Westinghouse company to improve the mechanical features of the dry battery tube and to make it a commercial success. * * * *

In constructing the WD-11 tube, the tungsten filament is replaced by a platinum filament coated with certain salts that will allow greater electron emission with less battery capacity. This insures a good amplifying tube with very little energy expended in heating the filament. This development has made possible a tube having all of the desirable properties of an untreated tungsten filament tube and which can be operated from the power supplied from a common dry battery.

Although the principle upon which this tube is designed has been known for some time, it remained for Westinghouse engineers to develop it commercially so that it would be sufficiently rugged to give even a longer life than was experienced with 6 volt tubes. Through processes that have been developed recently, the WD-11 tube has been perfected to the point where, if not mistreated, its life is in the neighborhood of 1,000 hours.

The WD-11 tube is an excellent detector and when used in this capacity operates to best advantage at 22½ volts applied to the plate. Although values of grid condenser and grid leak are not at all critical, good average values are 2 meghoms resistance for the grid leak and 250 micro mfds. for the grid condenser. Let it be said here that all WD-11 tubes are exhausted to an extremely high vacuum and they do not depend upon enclosed gas for their detecting properties. They are thus not critical in any adjustment either to filament current, plate voltage, or to the constants of the circuit in which they are used.

When used as an amplifier, the WD-11 tube may be supplied with plate voltages varying from 45 to 80 volts. Voltages upward to 200 volts may be used with corresponding increase in volume without [illegible]e to the tube. When using high [illegible]s on the tube there appears at [illegible]ithin the cylindrical plate a blue glow [illegible]at is sometimes mistaken by the uninformed as an indication of ionized gas such as would occur in a tube that has leaked or such as would be noted in a soft tube. This glow, however, in no way interferes with the operation of the tube and is thought to be caused by phosphorescence given off by the salts that are used to coat the filament. * * * * *

The WD-11 tube is designed for operation from a single cell of 1½ volts standard dry battery. When more than one tube is used in parallel an additional standard battery should be used for each additional tube, all dry batteries being connected in parallel. Care should be used to see that dry batteries so connected are all fresh, and old batteries should never be connected in parallel with new batteries. A fresh dry battery will operate a WD-11 tube intermittently from 60 to 90 hours, depending upon the length of intervals the tube is used. Of course, the battery current should always be turned off except when the tube is actually being operated. * * *

Quite recently the public press has elected to criticise the manufacturer of this tube, suggesting that the supply was being purposely curtailed to insure price maintenance and other improper factors.

As many will remember, the radio season last fall was a month or six weeks later in the year than would normally be expected as very warm weather persisted until well into December, with the result that the radio set in the home was not as well patronized as might reasonably be expected, for the reason that people found it convenient and entertaining to participate in diversions outside of the home.

With the coming of the colder and more inclement weather about the first of January, radio again became a convenient and attractive form of entertainment for the average family, with the result that a great demand was created for radio apparatus.

The manufacturer's stock of WD-11 tubes at the beginning of the radio season was in excess of 100,000, which was considered adequate in the light of previous demand to relieve all excessive demands for a period of several months, but, coincidnt with the opening of the radio season, the public largely by discovery that WD-11 tubes would function satisfactorily in all forms of radio appliances, almost overnight recognized the very superior merits of this tube, with the result that the substantial stock and, in addition, the daily output of the factory was rapidly absorbed despite the fact that production facilities have been crowded to the utmost and five or six times as many tubes are being made per day now as were made prior to January 1. The demand is still in excess of the supply, but the manufacturers express great hope that everyone will be provided with these very desirable tubes within the next thirty days.

Junior Physicist Wanted in Bureau of Standards

THE United States Civil Service Commission announces that an open competitive examination will be held throughout the country on June 6. It is to fill vacancies in the Bureau of Standards, Department of Commerce, for duty in Washington, D. C., or elsewhere, at entrance salaries ranging from $1,200 to $1,500 a year, plus the increase of $20 a month granted by Congress.

Applicants must have graduated with a degree from a college or university of recognized standing with the completion of at least 118 semester hours, or be a senior student in such an institution, and furnish proof of actual graduation within three months from the date of the examination. Undergraduate work must have included a course in the optional subject selected. Applicants must choose at least one of the following subjects: Heat, electricity, mechanics, optics, radio, physical metallurgy.

Competitors will be examined in the subjects of general physics, mathematics through calculus, practical questions on each optional subject chosen, and education, training, and experience. Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil service examiners at the post office or custom house in any city.

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R-3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. **Price, $35**

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3 stage **$75**

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New York: 370 Seventh Avenue

Write for booklet illustrating and describing the

MAGNAVOX Radio
The Power Amplifier and Reproducer Supreme

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New Records of the DX Nite Owls

Traded His Bed for a Morris Chair—Whoopee!

From J. E. Bradley, Box C, Justin, Texas

Have finally traded my Bed for a Morris chair, and can stay with 'em until day lite. Below is my log for my work on Monday night, 3-19-23. Left out several stations under 300 miles distance.

Call, Time, Program, Town, Miles

KSD—8:45—Announced, Market Conditions. St. Louis, Mo., 575.
WDAP—8:46—Trombone Solo, Chicago, Ill., 825.
WOS—8:47—Stephens College Glee Club, Jefferson City, Mo., 500.
WOAN—8:52—Singing. Lawrenceburg, Tenn., 600.
KLZ—8:54—Announcement, Denver, Colo., 625.
WCAY—8:58—Vocal Solo, Lady Playing own accompaniment, Milwaukee, Wis., 880.
KDKA—8:59—Band Stars & Stripes Forever. March, Time Signals, E. Pittsburgh, Pa., 1100.
WJZ—9:00—"Army Nite" Band. Medley old time tunes, Newark, N. J., 1425.
KFAF—9:10—Orchestra, Denver, Colo., 625.
WBL—9:12—Announcement, Anthony Kansas, 300.
KDYS—9:20—Vocal Solo "Man," announce Health Talk "Week," Great Falls, Mont., 1250.
WGM—9:30—Announce—Atlanta, Ga., 750.
Frank H. Jones—9:40—Orchestra "You Gave Me Your Heart" and Duet Hawaiian Guitar. Solo Hawaiian Guitar; line off 10:30 Cuban Time; Culiozna, Cuba, 1275.
KFDL—10:10—Vocal Solol, woman; Bert Wells at piano, Denver, Colo., 625.
KGW—10:37—Opera Play "12 Pounds," Portland, Ore., 1575.
WLAG—10:44—The Bachlor 4 Quartette, "Kentucky Babe," Minneapolis, Minn., 825.
WSB—10:45—Rochovels Program, Atlanta, Ga., 750.
WDAJ—10:47—Vocal Solo (Man), College Park, Ga., 750.
KHJ—11:07—Piano Solo, small girl sings and plays piano, Los Angeles, Cal., 1175.
KFDB—11:27—Orchestra "When the Leaves Come Tumbling Down," test program, San Francisco, Cal., 1400.
KFI—11:44—Messenger Boy Playing Harmonica, Los Angeles, Cal., 1175.
WDAF—11:45—Nite Hawks, Kansas City, Mo., 460.

Total number of miles, 19,465.

I keep a log like this every night I listen in.

It will be interesting in the future to look back and see what we listened to in the year 1923, won't it, eh?

I send greetings to all the DX Fellows. *Are there no Lady Dx'ers???*

I am still using my old 2-WD-11 tube set and it is hitting on all 2.

* * *

A One Night's Record

From Osborne Hinckley, 2436 W. 33d Ave., Denver, Colo.

I am sending you my DX record of the stations that I head in one night. I use a very simple hook-up, having only a tapped coil and a variable condenser besides the usual socket tube rheostat and grid leak. The first night I had this set I tuned in the following stations: KFEP, Denver; KDZQ, Denver; KLZ, Denver; KFAF, Denver; DD-5, Denver; WFAA, Dallas; WMZ, Memphis; WDAF, Kansas City; KSD, St. Louis; WLK, Indianapolis; WLAG, Minneapolis; WAAP, Witchita; WOC, Davenport; WDAP, Chicago; KMY Oakland; KDYL, Salt Lake City; KPO, San Francisco; KFI, Los Angeles; KHJ, Los Angeles; KGW, Portland, Ore.; KFZ, Spokane, Wash.

With this set I cannot tune the Denver stations out entirely when some other station is real close. But the interference is so weak that it does not bother long distance much. The stations mentioned above were heard in one night.

* * *

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

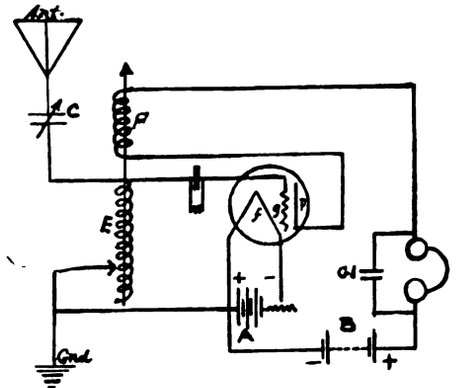
Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

He Touched the Right Spot and —Comes Back with More

From Frank P. McCullen, 210 West State St., Trenton, N. J.

MY hook-up, you published in the RADIO WORLD of the 24th, and my word to the effect that I would answer questions on hook-ups and how to overcome AC hum by using lights and a condenser in series on the 110 volt A.C. house circuit. Replacing the "B" Battery.



Mr. F. P. McCullen's single circuit receiver, which while conventional, gives good service.

Well! I have received 54 letters and numerous cards, requesting information, but I am game to the core. I am sticking it out answering and each day brings in more. I'll have to hire a stenographer if letters keep on coming in at the rate they are.

Have tried out another single circuit regenerative hook-up with W-D 11 tube, and in one evening picked up the following stations: WKY, WBAP, WDAF, WWAJ, CFCA, KSD, WJZ, KDKA, WGY, WFAA, WMAG, WLAG, KGW and the Atlanta Journal and Atlanta Constitution. This is not exceptional with good radio parts and above all, careful making—so many amateurs put too much speed in the making of a machine. I am sure anyone will heartily agree with me in this and also advise less speed—a few days longer makes a better job and you will never regret it.

Enclosed find hook-up that this record was made with and if there are any comments why fire away. I am ready. Yours for bigger and better radio.

With the Only Set in Town

From M. R. Smith, Gimli, Manitoba

HAVING read the records of the DX boys, I thought I'd send in mine. Mine is the only set in town. I have a single circuit, regenerative using no amplification. The following are some of the stations heard since January 30th: KWH, Los Angeles; WFAA, Dallas; WBAP, Forth Worth; KDKA, Pittsburgh; WHAZ, Troy; WHAS, Louisville; WWJ, Detroit; WLW, Cincinnati; also, WOC, WOI, WHB, KLZ, WFAF, WDAF, WCX, KDYS, KSD, WMC, WHA, CFAC, CKCK, CJCG, KYW, CKY, CJNC, WLAD, WLAG, WDAP, WAAP, WOS, WCAS.

* * *

Could Be Better, Could Be Worse, So 's 'Nuff

From A. K. Siler, Jr., 308 S. Narbeth Ave., Narberth, Pa.

I WISH to submit to the DX Nite Owls the following list of stations which I received since March 17. I listened only an hour each night and got all the close-by stations, using only one bulb (UV200), although I have a three-bulb set: KFDB, KDKA, WBZ, WOC, WMAQ, WLAG, WDAP, WLAK, WOAX, WHAZ, WHAM, WJAS, WJAX, WGR, WGI, WDAF, WHK, WHAS, WAAM, WNAC, WOAT, WEAS, KOP, WFAQ, WMAK, WOAW, WGM, KSD.

* * *

"Sparks" Comes in on DX

From C. Previti, Operator, S. S. Ponce

WISH to submit some DX work done on a neat home-made set costing $35, using an exceptionally sensitive circuit.

Have heard following: KHJ, WOC, WDAP, KYW, WHB, WWJ, KSD, WHAS, KDKA, WMAE, WGY, WHAZ, PWX, WSB, WJZ, WEAF, WOR, WPI, WFI, WKAQ, WOO.

These are only a few of the long distance, as other stations such as Denver, Cincinnati, Cleveland, Springfield, Mass., have been heard but am not sure of call letters.

All above stations have been heard plainly and practically every night on detector only, trip after trip during my week's stay in Porto Rico. The work which I can do on detector only using present set and circuit were never done by my former regenerative set and two steps. All stations were heard both during last summer and this winter, but as you know that during summer time atmospherics are fierce in the tropics.

* * *

67 On a WD-11

From Frank Baker, 420 South 5th St., Petersburg, Ind.

I HAVE read many DX records in your magazine, and am sending mine.

My set is a single-circuit regenerative, using one WD-11 tube, one variocoupler, 43-plate V. condenser, 3,000-ohm. phones, leak, etc.

The stations are as follows:

WJZ, WHA, KFAF, WCK, WOS, WOI, WDAJ, WAAF, WEAP, WEAF, WWJ, PWX, WCAD, WFAA, WLAG, WMAQ, WGF, WGM, KSD, WWJ, WMC, WSY, WSB, WBAP, WIAO, WCX, KDKA, WGY, WDAP, WHB, KYW, WOC, WOR, WHAS, WDAF, WIP, WTAS, WLW, WAAP, WBAV, WPA, WJAX, WLK, WOAI, WAAJ, WRAY, WGI, WKY, WGL, WDAE, WSAJ, WHAZ, 9DMB, WMAV, WMAT, WHK, 8YO, WIAR, WBZ, KFI, WCAE, KHJ, WBL, WMAK, WHAH.

The set was constructed at home.

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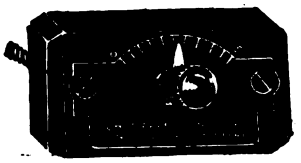
Just Out!

PANEL MOUNTING



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The only Variable Leak that is entirely sealed.

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Fifty-two issues for $6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

Protection of Vacuum Tube Filaments

THE radio fan is apt to experience disappointment when he finds that the high voltage leads from the "B" battery have been accidentally connected across the filament posts of his receiver and one or more tubes are burned out. Although the normal life of the average radiotron filament is considerably more than one thousand hours, it requires but an instant to destroy this delicate filament when excessive voltages are applied to its terminals.

When filaments are shorted across a 20, 40 or 60 volt battery in new condition the burn-out requires but a fraction of a second, and unless the user happens to be inspecting the tube at the instant of the flash the damage would not be discovered until the set was used again. It is a very easy matter to protect tube filaments by either of the following means:

(a) Insert a 100-ohm (non-inductive) resistance *for each 22-volt block of "B" battery* in the circuit next to the positive terminal of the "B" battery. This resistance may be left permanently in the circuit without any effect whatsoever on the normal life of the receiving set.

(b) Probably the most convenient form of resistance is a 25-watt, 110-volt tungsten lamp, which will provide sufficient protection for plate voltages up to and including 100 volts. This resistance automatically increases with the current so as to act, in effect, as a protective ballast lamp.

Radio Increases Church Attendance

THAT the broadcasting of religious services has increased church attendance, that radio has been a real help to the work of the church and has brought satisfaction and comfort to hundreds and thousands of people, is the opinion of the ministers of Schenectady, N. Y., who have been cooperating with M. P. Rice, director of broadcasting of the General Electric Company, in the transmission of church services.

From the inauguration of the radio church service by WGY, October 1, 1922, the studio management has cooperated very closely with the Ministerial Association of Schenectady, N. Y. The Ministerial Association, which is made up of the pastors of all the evangelical churches, named a committee of which the Rev. Robert W. Anthony, pastor of the First Presbyterian Church, is the head, to assist the studio manager in the assignment of clergymen for the vesper services and in planning the order in which the services of different denominations should be broadcast.

In nearly every case the morning and evening services of a church are broadcast. The church is connected to the transmitting equipment of the broadcasting station by means of land wires. Two microphones are placed in the church, one for the preacher and another for choir and organ. But for the presence of the microphones the church congregation would not be aware that the service, ordinarily limited to the four walls of the church, was going out into thousands of homes over a great territory.

A SENSATION

In New York and now Gaining an Enthusiastic National Reputation

KAUFMAN CIRCUIT

Designed by an Amateur and Dedicated to Radio Fans for Better Reception.

This Circuit acts like a three-star general, dependable, broad gauged and definite. It makes a recreation out of a fad. The wonderful results achieved on this marvelous circuit have forced us to turn over a New Department to handle the Kaufman Circuit exclusively for our Mail Order Patrons. You can get the whole circuit complete with a simple and clear diagram as follows:

KAUFMAN CIRCUIT, Drilled Panel, Active 20 Variocoupler, 46 Plate Vernier Condenser, Vern. Rheostat, Socket, 2 Variable Grid Leaks, .00005 Micon, .001 Micon, 34 Switch Points, 3 Levers, 2 Dials, 8 Binding Posts—ALL at This Specially Low Price. **$12.05**

Write out your order and pin a Post Office Money Order to it and Mail it to us. If you ask for our Catalogue, Given Free, you will learn of the Radio Instruments we offer for DX (Distance) work. Checks or stamps not accepted. Merchandise shipped postpaid East of the Mississippi.

D-X-Radio Co.

123 Liberty St. New York City

Tune in to
WDAP
—the powerful broadcasting station at

***The* DRAKE**

Lake Shore Drive and Upper Michigan Avenue, Chicago

From Porto Rico to lonely ranches in Alberta and Saskatchewan, from sunny San Diego to Quebec, and even a thousand miles out in the Atlantic and Pacific Oceans, programs from THE DRAKE are picked up. You'll be particularly well repaid by tuning in Tuesday, Thursday, Saturday, and Sunday evenings—concerts include selections by THE DRAKE Ensemble Orchestra.

WDAP Station is but a single interesting feature of THE DRAKE, Chicago's finest hotel. When in Chicago be sure to stop at THE DRAKE. See how concerts are broadcasted, and enjoy the world famous service and surroundings of this wonderful hotel. Information on request.

Under The Blackstone Management, the world's standard in hotel service.

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6.00 Amplifier Tubes 3.50
1.75 3 Plate Variable Condenser..... 1.25
3.75 23 Plate Var. Cond. Molded Ends.... 1.49

$4.75 43 Plate Var. Cond. Molded Ends....$2.75
5.50 W. D. 11 Transformer and for all dry cell tubes 4.50
4.75 Phones, 2200 ohms, splendid receivers 3.75
1.00 3-in. Hard Rubber Dial..... .35
.90 V. T. Sockets ..... .40
1.50 22½ V. Cyclone B. Batteries..... .89
1.75 22½ V. Cyclone B. Batteries..... 1.25
4.75 Thordarson Amp. Transformer..... 3.75

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Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested through the Service Editor of RADIO WORLD by the following:

J. O. Korand, 519 Grand Street, Hoboken, N. J.

R. R. Rudd, P. O. Box 511, Gainesville, Florida.

Charles J. Matonsek, 4601 North Karlov Avenue, Chicago, Ill.

H. Siegel, 1204 Broadway, Brooklyn, N. Y.

Mary Frances Koger, Route 1, Box 32, Mina, Ark.

Harry W. Handy, P. O. Box 151, Troy, N. Y.

J. W. Abbott, Box 1055, Bartlesville, Okla.

A. C. Major, 65 West 14th Street, Atlanta, Ga.

A. S. Myers, 312 McDougal Street, Brooklyn, N. Y.

Fred A. Frey, 308 Madison Avenue, Roselle Park, N. J.

Arthur D. P. Born, 193 Third Avenue, Long Island City, N. Y.

Leo H. Ware, 8714 Quincy Avenue, Cleveland, Ohio.

Mrs. Irene S. Flegler, 3015 Baltimore Street, Kansas City, Mo.

W. D. Love, 3015 Baltimore Street, Kansas City, Mo.

F. P. Woodruff, 1024 Western Avenue, Topeka, Kan.

C. S. Gutermuth, secretary, Berlin Electric Light, Heat & Power Co., Berlin, N. Y.

Jackson E. Scarl, 362 Hanover Avenue, Allentown, Pa.

W. H. Short, 113 N. Limestone Street, Lexington, Ky.

Dr. O. L. Herke, 6603 Detroit Avenue, Cleveland, Ohio.

J. McCall, McCall's Garage, Decorah, Ia.

C. B. Winkler, 17 W. Lincoln Ave., Mt. Vernon, N. Y. (Especially interested in sets using indoor loop.)

R. A. George, 62 N. State Street, Concord, N. H.

Oscar T. Bucide, Argusville, North Dakota. (Wants wholesale prices on radio parts.)

The Van Blaricorn Company, 20 South Main Street, Helena, Mont.

Sandy Bennett, Camas, Wash.

C. O. Wheeler, R. F. "A," Box No. 1, Miami, Fla.

Rochester Radio Experimenting Laboratories, 524 Cross Street, Rochester, N. Y.

Houston Electric Company, 214 Vine Street, St. Louis, Mo.

Julius Miller, 121 West 114th Street, New York City.

William Wake, 4018 West 25th Street, Chicago, Ill.

Daniel Feder, 312 Cherry Street, New York City.

Fred P. Ronnan, 37 Sackville Street, Halifax, N. S., Canada.

R. B. Fleming, 1215 Peabody Avenue, Dallas, Texas.

D. F. Finger, 27½ South Tryon Street, Charlotte, N. C.

E. T. Day, So. Connellsville, Pa.

E. A. Rean, 1317 Banks Avenue, Superior, Wis.

Ralph Anderson, 514 Fiftieth Street, Milwaukee, Wis.

No More Loose Phone Connections

Manufactured by the Saturn Mfg. & Sales Co., Inc., 48 Beekman Street, New York City.

A PLUG recently put on the market by this firm incorporates a novel and useful feature. By the use of this plug all screws and slip connections are entirely eliminated, it only being necessary to slip the phone tips into the proper holes in the back. A tooth-slip of hardened copper takes hold of each tip, and the harder you pull on the cord the more solid the grip exerted on the tip itself. When it is desired to change the phone tips, or remove the phones from the plug, all that is required is to press a small projection on the back of the plug and the tips are released. Besides this novel idea it is also made up of the best materials, and the brass nipple and sleeve of the plug itself is machined and polished to a fine degree. It is a very well manufactured piece of apparatus of its type.

Radio Stocks

(Quotations as of April 11, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	7*
American Marconi, Unstamped.	$5	$7
American Tel. & Tel.....	122½	123
Canadian Marconi	2¼	3
De Forest Radio.....	7	10
Dubilier Condenser	12	12¼
English Marconi com.....	11	15
English Marconi pfd.....	11½	15½
Federal Tel., Cal.....	5	5½
General Electric	180	181
Hennessy Radio Corp. 8% pfd.	9	11
Mackay Companies com.....	111	113
Manhattan Elec. Supply.....	58	59
Marconi Int. Marine.....	7	9
Radio Corporation com.....	4⅛	4¼
Radio Corporation pfd.....	3⅝	3¾
Spanish Marconi	1	3
Western Union	110½	111
Westinghouse E. & M.....	59½	60

*Cents per share.

Radar Adjustable Leak

THE Radar Instrument Company, 224 Market Street, Newark, N. J., is manufacturing an adjustable leak which is unique in design and has some interesting features. The Radar is entirely enclosed, so that its parts are protected from dust and dampness. It can be mounted inside of the panel with its control knob on the outside of the panel, and it can be fastened on the base without requiring a standard mount. These features and the fact that the Radar fits any standard grid leak mount should make it a very popular article.

New Distributors of Radio Supplies

ONE of the largest automobile supply distributors in the country—the Times Square Auto Supply Company, New York City—has added a radio supply department to its business.

Amsco Products, Inc., is a New Combination

ON May 1, 1923, the Mortimer Radio Corporation, manufacturers of the "Melco Supreme" radio-frequency receiving set, and the Advance Metal Stamping Company, manufacturers of high-grade parts, both of New York City, will consolidate and be known in the future as Amsco Products, Inc.

The "Melco Supreme" radio-frequency receiver will continue to be marketed under its own name, while a complete line of parts will be available at all good dealers under the "Amsco" brand. The new home of Amsco Products, Inc., will be in the Fairbanks Building, Broome and Lafayette Streets, New York City. Ideal manufacturing facilities will enable this concern to give even better service than was possible before the consolidation.

Short Cut Antenna an Ingenious Device

THE Short Cut Radio Corporation, 243 West 54th Street, New York City, have just brought out a new product, "Short Cut Antenna," which they claim eliminates the aerial as well as loops, electric light plugs, etc. The nature of the "Short Cut" is that of a super-condenser though its peculiar and valuable properties are due to certain patented features. The fact that the product makes a set portable in addition to clarifying signals, eliminating code and reducing interference troubles generally to a minimum, should make it of especial interest to dealers, now that the summer season is coming on.

"The A, B, C of Radio"

RADIO enthusiasts will be interested in "The A B C of Radio," which Modells advertise for distribution to RADIO WORLD readers. This is a 62-page book, replete with diagrams and drawings, and was written by the former editor of a popular scientific magazine. It is claimed that 200,000 copies of "The A B C of Radio" have been sold at the retail price of 25 cents. Modells have purchased a quantity for distribution to RADIO WORLD readers, who will be placed upon the mailing list which this concern keeps on file. There is a charge of 10 cents to cover cost of forwarding. An announcement regarding this is made by Modells in this issue of RADIO WORLD.

Neon Lightning Arrester

THE Neon lightning arrester, manufactured by the Neon Lamp Works, 62 West 114th Street, New York City, makes use of neon gas, which is absorbed from the air by a very complicated chemical process. Neon gas is an excellent electrical conductor, and its resistance, compared with that of air, is 1:165. This means that the discharging efficiency of a lightning arrester with neon gas is excellent, and it is guaranteed to discharge over 220 volts. The Neon lightning arrester can be also used as a rectifier for small currents.

A New Radio Company

Radio Improvement Co., New York City, $25,000; P. D. Wesson, H. J. Fitzpatrick, E. Luiscomb. (Attorney, P. S. Jones, 300 Madison Avenue.)

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Saturn TRADE MARK Products

The Saturn Automatic Radio Plug

The Plug with the RED SEAL

No Screwdriver required! Not necessary to dissemble!

To make connection just insert terminal tips, and contact is made. The more you pull, the better the contact. To take terminals out, just press the release lug and the tips fall out.

Every plug sealed and fully guaranteed. Sells now for $1.25

The Saturn "PERFECT" Jack

An improvement on all others.

Crowfoot offset: Allows easy soldering.

Bracket, the mainstay of every jack, made of specially rolled Brass, with rounded edges. This insures uniformity, strength, appearance.

Blades: Spring temper German Silver, enforced where needed.

Contact Points: Genuine Sterling Silver.

Nipples: Shoulder type, with two 1/16" washers, insuring perfect fit to the panelboard.

All parts, except Blades, nickeled and highly polished.

No. 1. Single Circuit, Open....$0.50
No. 2. Single Circuit, Closed.. .55
No. 3. Double Circuit, Closed. .70
No. 4. Single Filament Control .75
No. 5. Double Filament Control .80

The Saturn Mfg. & Sales Co., Inc.
Dept. R.W.
48 Beekman Street
New York, N. Y.

Blueprints of Sets and Circuits

IN reply to hundreds of inquiries, RADIO WORLD desires to state that it does not supply blueprints of sets and circuits published in its columns unless the articles in question so state specifically. This announcement is made to save time and avoid disappointment to readers.

Private Radio Broadcasting Starts in Japan

SEVERAL private Japanese concerns are now permitted to broadcast government reports, speeches and music by radio, the government having relaxed its rigid policy, advices from Japan to the Department of Commerce state. Only a few financially sound companies in Tokyo and Osaka, and perhaps one or two other large cities, will be licensed. A broadcasting tax is required by the government after April 1. The companies will charge subscribers a fee for the service rendered, which the government will collect, returning a percentage to the broadcasters. Individual users of broadcasting and receiving sets will not be permitted to communicate with each other, it is stated. Complete receiving sets will cost between 20 and 30 yen, or between $10 and $15, it is anticipated by Japanese experts.

Milwaukee Radio Amateurs' Club Active

THE Milwaukee Amateurs' Radio Club has been incorporated under the laws of the State of Wisconsin as a non-stock body, and its name changed to The Milwaukee Radio Amateurs' Club, Inc. The incorporators were L. S. Baird, C. N. Crapo, and Attorney L. J. Topolinski, the society's general counsel, through whose efforts state incorporation was brought about. In addition to including the past purposes of the club and those of the American Radio Relay League, Inc., the articles of organization provide that the society may own and operate an amateur radio station and may associate itself with the A. R. R. L. as a Milwaukee section or local chapter.

Meetings continue to be held weekly at 7.45 P. M., Thursdays, in the Trustees' Room of the Milwaukee Public Museum. Business Manager L. S. Baird recently received the appointment as A. R. R. L. Central Division Publicity Manager, and in order to devote proper attention to his new duties his chairmanship of the Meetings and Papers Committee has been transferred to H. F. Wareing, president of the society. This committee is now arranging for a series of lectures on timely radio topics. R. E. Lathrop, 9ATX, of the club's technical committee, represented Wisconsin at the Michigan State A. R. R. L. convention held at Flint, Mich., and upon his return gave the Milwaukee club members a lengthly report.

Radio frequency amplification has been the subject of several general discussions at meetings, and a paper entitled "Intervalve Radio Frequency Transformers" was presented by I. H. Strassman, 9AHO. Mr. Strassman, who is A. R. R. L. City Manager, has also reported from time to time the progress being made in ridding the air of unlicensed stations. These offenders have operated much to the discomfort of both the radiophone listeners and the amateurs.

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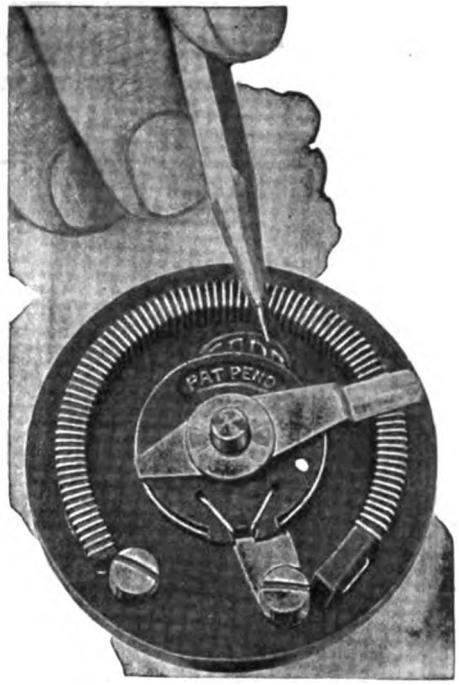

Fada Vernier Rheostats

used on your radio receiver brings in broadcasted concerts from stations thousands of miles away—by giving super-delicate control of the filament current of the detector tube.

Fada rheostats and potentiometers are practically standard with hundreds of thousands of radiophans who construct their own radio receivers.

120-A Rheostat (5 ohm).....$0.75
121-A Power Rheostat (1½ohm) 1.20
150-A Vernier Rheostat (5 ohm) 1.25
151-A Ver. Attachment..... .50
152-A Potentiometer (200 ohm). 1.00
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Send 10c for a copy of the FADA Handbook—a real aid to your experimental work.

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Use an ELECTRAD DIODE TUBE and get real results. Tube and socket, Special Price..... $2.50

PHONES		TUBES	
$8.00 Brandes Superior Phones	$5.95	$6.50 DeForest Detector and Amplifier	$3.95
$5.00 Federal Phones	3.25	$6.50 U. V. 201	5.95
$5.50 Murdock Phones, 2000 Ohms	4.35	$6.50 Cunningham 301	5.75
$5.50 Rico Phones, 3000 Ohms	4.35	1½-Volt Tube, guaranteed	4.75
$12.00 Baldwin Phones	8.95		
$6.00 Single Baldwin	4.50		
Acme Transformer	$3.95	$5.00 Fischer Variometer	$2.10
Bakelite Sockets	.50	$5.00 Fischer Variocoupler	2.10
Cortlandt Special Sockets	.39	23 Plate Variable Condenser	1.85
Rheostat Special	.49	43 Plate Variable Condenser	2.35
		W.D. 11 Transformer	3.45

Cortlandt Radio Co., 80 Cortlandt Street, New York City

Mail Orders Promptly Filled—Include Postage and Money Order

FOR ONLY $7.00

You get all the parts necessary to build complete

OUR RADIO PUP SET

We get favorable comments from all who have built it.
IT HAS MADE GOOD! THE BEST BUY OF ITS KIND EVER ASSEMBLED!

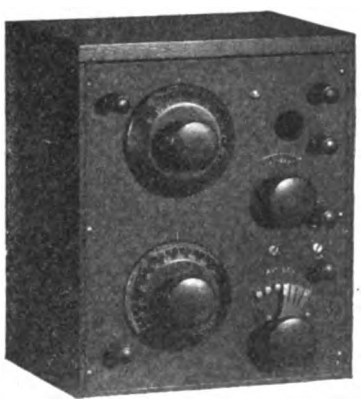
We have all the "Hard-to-Get" Radio Supplies at Prices That Are Right.
MAIL ORDERS PROMPTLY FILLED
Electric Service Engineering Co., 105 West 47th Street, New York
Bryant 2743

Buy That Set NOW

The Clapp-Eastham Regenerative Receiver is a wonderful set. Well worth the regular price of $40.00. At our special price of

$25.00

it is the most wonderful set you can buy. A limited number to be sold at this price.



The type HZ two stage amplifier is equipped with the new Maximus Amplifying Transformers, and will increase the range of any receiving set. The regular price is $40.00; our special price

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One Year, 52 Issues..... 6.00
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Partial Program from WGI (360 Meters)

STATION WGI, operated by the American Radio & Research Corporation, Medford Hillside, Mass., announces the following program for the dates named:

Saturday, April 21, 1923

6:00 P. M.—New England Weather Forecast, furnished by the U. S. Weather Bureau. Late News Flashes, Early Sports — Boston American.

6:15 P. M.—Condition of the Massachusetts Highways, furnished by the Automobile Legal Association.

6:30 P. M.—Boston Police Reports—Boston Police Headquarters. Amrad Bulletin Board.

6:45 P. M.—Code Practice, Lesson Number Thirty-eight.

8:00 P. M.—Evening Program.

1. Third of a series of talks on New England Problems, under direction of the New England Business League.
2. Concert by Coyne's Orchestra of Lawrence; Mr. Matthew T. Coyne, Director.

Sunday, April 22, 1923.

4:00 P. M.—Twilight Concert.

8:30 P. M.—Federation Church Service, conducted by Rev. Fred Alban Weil, Pastor of the First Parish Church of Quincy; assisted in the music by the Quartette of the Church.

9:00 P. M.—Musicale by the Quartette of the First Parish Church of Quincy. Mrs. James H. Slade, Soprano; Miss Angela C. McCarthy, Contralto; Winthrop D. Webb, Tenor; John E. Greene, Bass; John D. Buckingham, A.G.O., Director and Organist.

Broadcasting Schedule of the Detroit News

The present broadcasting schedule of the Detroit News, Detroit, Mich., station WWJ, is as follows, the regular evening program beginning at 7 o'clock one week and at 8.30 the next week, alternately:

Week days, every day in the year, except as otherwise noted:

9.30 to 9.45 a. m.—Hints to housewives.

9.45 to 10.25 a. m.—Health or economic talks (Uncle Sam).

10.25 to 10.30 a. m.—Weather report.

11.55 to 12.00 noon—U. S. Naval observatory time signals.

12.05 to 12.45 p. m.—Impromptu musical selections (usually).

3.00 to 3.30 p. m.—Detroit News Orchestra (usually).

3.30 to 3.35 p. m.—Weather report.

3.35 to 4.15 p. m.—Market quotations.

5.00 to 6.00 p. m.—Miscellaneous, markets and Government messages.

Week nights except Saturday: For weeks of April 1, April 15, April 29, etc., 7.00 to 8.30 p. m.—Concert. For weeks of April 8, April 22, etc., 8.30 to 10.00 p. m.—Concert.

Thursday special—On alternate Thursday nights this station is now giving a program between 11 and 12 p. m. for the special benefit of listeners at distant points. This "midnight special" falls on those weeks which have regular programs from 8.30 to 10.00, as scheduled above.

The Detroit News does not broadcast on Saturday nights, this omission being a courtesy to Detroit people who wish to tune in distant stations.

Sundays—Sundays of April 15, April 29, etc., 11.00 a. m.—Church services at St. Paul's Episcopal Cathedral. The Very Rev. Warren L. Rogers, dean, is usually the preacher. 5.30 p. m.—The Detroit News Orchestra. Sundays of April 8, April 22, etc., 2.00 p. m.—Detroit News Orchestra. 7.30 p. m.—Church services at St. Paul's.

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Makes Your Set Portable

SHORT-CUT ANTENNA

Pat. Pending

Good Bye Aerials!

USE

Short Cut Antenna

An ingenious device (a super-Condenser) that replaces aerials, loops, electric light plugs, etc.

Postpaid, Anywhere, for $5.00

Satisfaction Guaranteed

Short Cut Radio Corp.

243 West 54th St. New York

SUNBEAM

$8.00 Dictograph Phones $5.95

None Better Made at Any Price

$8.00 Brandes Phones Matched Tone, $5.75

Complete Radio Price List Sent Free upon request

Sunbeam Elec. Co.

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Farm Lighting Plants at Bargain Prices. For Yachts, Motor Boats and Country Homes

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The Great Illustrated National Weekly

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$3.00 Six Months; $1.50 Three Months)

RADIO WORLD

1493 Broadway New York City

Western Union Feels Radio Competition

ALTHOUGH the business of the Western Union Telegraph Company was larger and more profitable in 1922 than in 1921, President Newcomb Carlton devotes a considerable portion of his annual statement to stockholders to a résumé of the competition with its cable business caused by the rapid development of radio communication. President Carlton says in part:

"Radio has made substantial progress during the year, not only in improved service, but in capturing additional business with low rates from the cable companies. The advantages still lie with the cables, but they need waking up. The cable art has not advanced as it might have advanced, and as it must advance, under the stimulus of a cheaper means of communication. Whether the radio is in fact cheaper than the cables cannot be answered now, but this much can be said: 'That the present radio rates were not based on the cost of operation. These rates were arbitrarily fixed to attract business.'

"Now that business has been attracted, and the investment necessary to transmit business between the United States, Great Britain and Europe is mounting to important figures, the investor will no doubt show an increasing interest in the question of the adequacy or inadequacy of radio rates. These rates between the United States and Europe are about 30 per cent. less than the cable rates, and, principally because of their lower charges, the radio has captured 20 per cent. of the United States-European business.

"It has been our view that the resources of radio will be combined with those of the cable in the development of a system of world communication that will place the United States first among all countries for capacity and reasonable rates, provided the government will adopt a progressive and business-like method of dealing with cable companies.

"We are disposed, therefore, to think of the radio in terms of a great medium of transmission, and as a potential ally rather than in terms of a continuing competitor. Whatever way the question may be decided, and regardless of the downward trend of rates, it should be borne in mind by Western Union shareholders that more than 90 per cent. of the income available for dividends in 1922 came from their nation-wide system of land line services, which does approximately 85 per cent. of the land line telegraph business in the United States. In fine, if there had been no net income from the cables in 1922 the company's net income would not have been materially reduced."

The operating revenues of the company for 1922 are reported as $105,447,748, compared with $104,155,113 in the previous year. Net operating revenues totaled $13,796,473, against $10,196,029. After crediting other income, deducting interest charges and appropriating $2,000,000 for the development of ocean cables, there was a balance of $11,158,180 available for the capital stock, equal to $11.17 a share earned on the $99,817,000 stock outstanding. In 1921 the balance was $9,633,808, equal to $9.65 a share on the stock. The general balance sheet on December 31, 1922, showed net current assets of $38,393,265 and net current liabilities of $26,045,369.

DX Radiomania

THE man who used to grunt and groan and stay awake nights said it was insomnia, but now when he gets to the office looking as though he needed sleep he generally blames it on—"Dawgone, he didn't sign off, and then some blame nuisance butted in and I couldn't get his call." It's all one, whether you call it radiomania or insomnia—it keeps you up just the same.

To Modell's Radio Stores,
191 Fulton St., New York

Please send as per offer to RADIO WORLD readers, one A. B. C. of Radio. I enclose 10c, which covers cost of forwarding.

Name .....

Street Address .....

State .....

CUT HERE

An Offer to Readers of RADIO WORLD

The A. B. C. of Radio, 200,000 which have been sold at 25c, is available to you for only **10¢** postpaid with the above coupon. It is a 62 page book, written in clear, simple terms by a nationally known expert, explaining the underlying principles of

WIRELESS TELEPHONY

With Diagrams, Drawings and Glossary

It is possible for us to make this offer for your benefit, as we want your name on our mailing list, so that we may be in touch with you.

Write today for this wonderful book, enclosing 10c coin with coupon.

MODELL'S 191 Fulton St. NEW YORK

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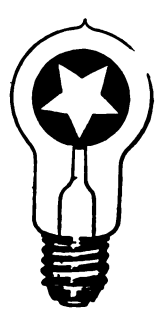

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An attractive piece of furniture so constructed and designed to meet all the requirements in making a neat installation of the radio in the home. Its many advantages and moderate cost make it almost indispensable.

For Sale By First Class Furniture and Radio Dealers or Write

ROBBINS WOODWORKING CO.

LIBERTYVILLE, ILLINOIS

You Need It!

Have you seen the book-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20?

This book-up actually goes out and drags the distance in, and lays it at your table.

All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?

If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

TRADE "VAC-SHIELDS" MARK
bring in DX

The invention of this non-magnetic shield cuts out electro-static effects between vacuum tubes, which cause distortion, make it difficult to tune in distant stations—Guard tubes against breakage.

For UV-200—201—201-A; C-300—301—301-A; WD-11, and WD-12 by mail postpaid $1.00.

U. S. Patent Pending

ORANGE RESEARCH LAB.
41 North 16th Street East Orange, N. J.

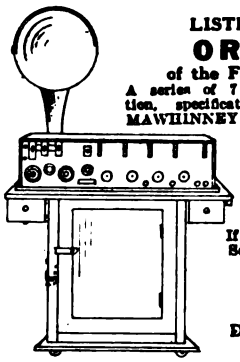
High Speed Communication at Sea

ON the last voyage of the White Star Liner "Majestic" the world's greatest steamship, radio messages were exchanged with shore stations of Radio Corporation of America at speeds of over 80 words per minute when the vessel was 1,000 miles at sea. Ordinarily speeds in excess of about 25 words per minute cannot be attained by hand sending and in order to meet the demands of increasing radiogram traffic created by the large passengers liners, machine sending must be used in which case a given message can be sent and received in one-third the time required by manual methods.

The earlier experiments aboard the "Majestic" permitted only one way high speed transmission, namely, from ship to shore, there being no apparatus on board the vessel capable of receiving high speed transmission. In order to effect *two-way* high speed telegraphic service on the vessel during its last voyage to New York, it was equipped by the Marconi Company with a high speed receiver which worked most satisfactorily. High speed signals were also received from Paris at a distance of eight hundred (800) miles at a speed of 80 words per minute. Wireless press was completely and perfectly recorded by the automatic receiver through medium static from the station of RCA at Chatham, Mass. At the same time that this automatic high speed reception was carried out it was possible for the operator on watch to listen in on the ordinary ship's wave length for general "ship to ship" wireless.

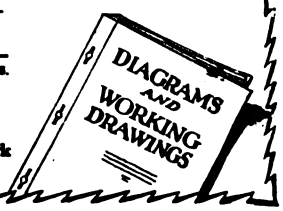
Not only does the use of automatic high speed receiving and sending apparatus enable operators to handle more traffic in less time and thereby provide freedom of the ether for other vessels to operate their radio sets but in addition secrecy of communication is maintained, owing to the great rapidity with which the dots and dashes are transmitted. It is difficult for the average operator to copy over 30 words per minute for any length of time, consequently when working at double speed the telegraphic symbols follow in such rapid succession that they cannot be deciphered.

LISTEN IN ON—Stockton, Cal., or Seattle, Wash.
ORIGINAL BLUE PRINTS
of the Famous MAWHINNEY RECEIVING APPARATUS



A series of 7 blue prints giving in full detail all the necessary information, specifications, and method of construction, and assembling of the MAWHINNEY RECEIVING Apparatus. This is the 5-tube receiving set that picked 5 stations in California, recently written about in Literary Digest and Radio Globe. The Blue Prints tell you in a very simple and clear manner just how to construct a duplicate of MAWHINNEY'S trans-continental receiving set.

If your dealer cannot supply you—
Send $2.00 for complete set of prints.



A. S. MAWHINNEY
891 RIVERSIDE DRIVE
Dept. 29 New York

A Revision of the Gibbons Circuit

In RADIO WORLD for March 31, 1923, was published a diagram of a circuit as used by Mr. Earl E. Gibbons, which contains an error.

The potentiometer should be in shunt of the 6-volt A Battery. This puts the detector rheostat in series with the potentiometer from the negative A Battery, which will make it inoperative.

The first and second step rheostats are in series with the potentiometer from the negative A Battery, with positive returns. Thus, the potentiometer being of high resistance, would make the filament controls useless.

In order to correct the error, the potentiometer should be shunted across the 6-volt battery and the polarity of the battery should be changed.

New Use for the Panama Canal

First Bug—"Say Al, you know I picked up Seattle, Washington, last night? Came through great. Three thousand miles. Some stuff for DX, what?"

Second Bug—"Stand by, stand by, brother! You can't tune me to that wave. That's overland, buddy, and the old stuff don't skip over terra firma like she does over the water."

First Bug—"Aw, say! Lay off the QRM! May be my stuff came through the Panama Canal!"

SOMETHING NEW
THE H.K. INDUCTANCE SWITCH

Every one knows the difficulty encountered in drilling holes in a panel for switch points and getting them spaced correctly. The H. K. Multiple Switch does away with this troublesome drilling. Can be mounted on a panel in about the same time it takes to mount a rheostat. Has 15 contact points, each fitted with two nuts for connecting taps from inductance.

Complete, with dial calibrated from 0 to 14.

The new H.K. Inductance switch has many advantages over old style of mounting, namely: This switch has a good bearing, which assures good contact; can be shielded from panel if desired, thereby eliminating capacity effect.

The terminals are placed so wires can be attached with ease. It requires only two holes to mount on panel. Can be used for table or panel mounting. Furnished with Knob and Pointer or Dial. Dial numbered to indicate contact in use.

Price, complete with dial.....$2.00

Special prices to Dealers and Jobbers.

Knoop & Pence Co., Peotone, Ill.

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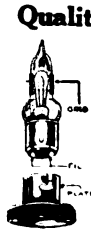
Send us your name and address and say that you want to become our correspondent. We will show you how you can represent RADIO WORLD in your locality and at the same time make money for yourself. We would particularly like to hear from those who are handling the "Saturday Evening Post."

Address Correspondent Editor, Radio World, 1493 Broadway, New York

Economy! Quality! Service!

The DELTA is a 3-volt dry cell tube, using a 22½-volt B Battery.



Regular Hook-Up and our own Conversion Hook-Up included Free with every Tube.

No Grid Leak or Grid Condenser necessary.

DELTA MIDGET TUBES

The Delta can be used as a detector in any successful circuit.

The price is only..... $2.50

Guaranteed 1,000 Hours' Service

Composition Delta Socket, 40c each
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All Wave Coupler, Free Diagram.....$3.30
180 Degree Bakelite Coupler..... 1.90
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King Variometer, 800 Meters..... 2.25
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Grade A Hard Rubber Panels
7x10....$0.75 7x18....$1.25 7x24....$1.80

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43 Plate Precision Condenser 1.55
Audio Transformer. $5 value. Special.... 2.95
Electric Soldering Iron, 50 Watt..... 5.00

Also other bargains—write for list

Economy Radio Company
132 Nassau St. New York City, N. Y.

To Radio World readers who may have missed recent numbers

The newsstand sales of Radio World have increased so rapidly for several weeks past that some of our readers were disappointed to find their regular newsdealers had sold out their supplies. This is for you; if you are among the disappointed ones: Send 15c. per copy and we will mail you any of the recent issues that you may have missed, so that you can complete your files.

RADIO WORLD
New York

General Broadcasting Schedule of Station WDAP

THE general broadcasting schedule of Station WDAP, Drake Hotel, Chicago, which is also the official station of the Chicago Board of Trade, is given below. The market reports are sent on 485 meters and the concerts on 360 meters. Following is the schedule for all busiess days:

9:30 A. M.—Receipts and shipments; estimated carlots; local weather report; opening future markets: wheat, corn, oats, rye, barley, pork, lard and ribs.
10:00 A. M.—Future quotations; live-stock receipts and prices.
10:30 A. M.—Future quotations.
11:00 A. M.—Future quotations.
11:30 A. M.—Future quotations.
12:00 Noon—Future quotations and cash grain prices.
12:30 P. M.—Future quotations.
1:00 P. M.—Future quotations.
1:15 P. M.—Musical program by Henry Selinger and the Drake Concert Ensemble.
1:25 P. M.—Closing future quotations and high and low for day; cash grain prices; gross bids for cash grain to arrive.
3:15 P. M.—Closing quotations, Chicago Stock Exchange, by Paul H. Davis & Co.
6:00 P. M.—Closing quotations; news items.

(On Saturdays the closing prices are sent at 12:05 P. M. instead of 1:20 P. M. The Visible Supply changes are sent when posted.)

Regular Concert-Sending Schedule. 10:00 P. M., Tuesday, Thursday and Saturday evenings; 9:15 P. M., Sunday evenings.

Announcement of Special Programs or Features will be made from the Station.

On Tuesday, Thursday and Saturday nights the program is divided between artists in the studio and Jack Chapman's Orchestra, playing dance music in the main dining room of the Drake Hotel.

On Sunday nights the program is divided between exceptional artists in the studio and Henry Selinger and the Drake Concert Ensemble, playing in the main dining room.

Partial Program of WGY for Week of April 22

WGY, General Electric Company, Schenectady, N. Y., will broadcast the music and speeches of the annual dinner of St. George's Society of Albany, N. Y., Monday evening, April 23. The principal speaker will be Captain Kilroy Harris, D.S.O. Captain Harris was king's messenger, and, following injuries received during the war, he was appointed official war lecturer for the British and United States governments.

Sunday, April 22, WGY will broadcast the morning and evening services of the Second Presbyterian Church of Amsterdam, N. Y. In the afternoon, at 4 o'clock, the WGY Symphony Orchestra will give a program, assisted by William Demorest, boy soprano.

William DeMille's play, "Strongheart," will be produced Tuesday evening, April 24, by the WGY Players, headed by Edward H. Smith.

Wednesday evening is "Silent Night" at WGY, and the following night the American Locomotive Company Band will give a concert.

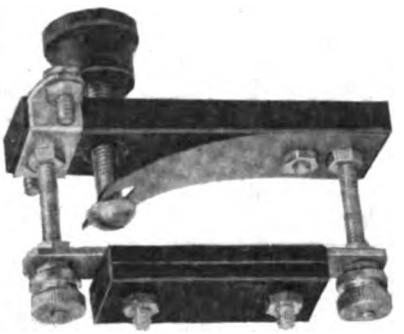
The Commercial Bank Club of Albany will entertain from the General Electric station Friday night, April 27. The program will consist of orchestral numbers, quartet and solo selections. Saturday night, from 9 to 11 o'clock, Cain's Castle Orchestra will play.

New Radio Firms

Barclay Electric Co., New York City, $20,000; Stelz, D. Grossman, J. McCoy; attorneys, Reit & Kaminsky, 305 Broadway.

Imperial Radio Corp., Jersey City, N. J., radio, $500,000. E. Russell Carlisle, R. E. Albin, New York; C. E. Grant, Canada.

Another Horton Triumph



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May be used with any type Fixed Condenser.
Guaranteed for 3 Years.
Makes Radio Reception a Pleasure.
For Sale by all leading dealers.
Price $1.00—With Condenser add 25c.

If your dealer cannot supply you, one will be sent postage prepaid on receipt of your money order.

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Federal Phones 5.00
Bradleystats 1.70
150-3000 Meter Silk Wound 3 Bank Wound Coil 3.50
Woodehorn Loud Speaker..... 5.50
King 800 Meter Variometer..... 3.00
N & K 6000 Ohm Phones..... 6.50
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General Radio Transformer..... 4.75
DeLuxe HomeCharger 15.00
Grade A Panels .....1½c per sq. inch

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To the DX Nite Owls

and anyone else interested in radio! If you missed last week's RADIO WORLD, with the famous Flewelling Circuit, get in now and get your EARS WET now! Send 15c or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE?

Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want.

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Sensitive over the entire surface.
Dealers—Write for unusual proposition.
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FREE Illustrated Booklet on Radio Frequency Amplification with circuit diagrams and operational characteristics. By LESTER L. JONES Formerly Expert Radio Aid, U. S. N.
DANZIGER-JONES, INC.
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AND POSTAGE.
Also other vacuum tubes, excepting VT-1 and VT-2.
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We Will Mail You One
"VERILOUD" SYNTHETIC RADIO CRYSTAL
COMPARE IT WITH WHAT YOU ARE NOW USING
IF OURS IS BETTER MAIL US 30 CENTS
NOT Return it at Our Expense
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322 9TH ST. BROOKLYN, N.Y. South 2650

A Plan for Selling Radio Sets to American Legion Posts

RADIO dealers and retailers should be interested in the plan described below by which the J. Burt Pratt Post, of the American Legion, at Virginia, Minnesota, financed the purchase of a radio set. A similar plan might be proposed by dealers to American Legion posts in their local territory. A. R. Hulbut, publicity officer of the post named above, sends to the American Legion Weekly the details of the plan as follows:

"Three hundred shares of stock were issued to sell at one dollar a share. Any member could buy up to five shares. After enough shares were sold we bought an outfit and a radio club was formed. The post then agreed to take up the shares at their face value, merely transferring them into dues accounts. This was not done all at once; in fact, it is being done only as the post gets money enough in its treasury so it can spare the dues, but the members of the radio club know that eventually the post will repay them for their stock. Although we have no radio in the club at present, we are not worrying, because we only got rid of the old one to buy a better one.

"I would recommend the above procedure to any post, and have no hesitancy in stating that radio will make the post clubrooms a greater gathering place than ever. We in Virginia had the opportunity to hear a snappy talk by Department Adjutant Stafford King by radio just a few days ago, the significance of this being that eventually every Legion post will have a set and we will find it possible to have a Legion radio night throughout the country, and can open our meetings with talks from national as well as department officers while we are sitting right in our own clubrooms.

"I have often thought of a National Headquarters broadcasting station at Indianapolis, which I believe would do more to advertise the Legion than any other medium. Such a station would now reach over a million people and would eventually mean a radio in every Legion post. Imagine a night, known as 'Legion Meeting Night' throughout the United States, when every post would meet and could hear a message from the National Commander."

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INVENTION RECORDING BLANK
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FREE BOOK MANUFACTURERS PATENT CO., INC. 520 FIFTH AVE NEW YORK

Some Set. The New Flivver.
1000 *MILES EASILY*
reached with one tube. Very selective. Complete instructions and parts, less tube and batteries, $4.95. Assembled unwired $9.90.
PIERCE RADIO SHOP
11 Harvard Street Springfield, Vt.

Standard Merchandise at Cut Rate Prices

	List Price	Our Price
Framingham Plain Rheostats	$ .75	$ .65
Framingham Vernier Rheostats	1.25	1.10
Kiesner Vernier Rheostats	1.50	.99
Kiesner Vernier with Dial	1.50	1.30
Freshman Variable Grid Leak	1.00	.79
Rapco WD-11 Transformers	5.00	3.95
Cleo Two-Way Plugs	1.00	.75
Pilot Plugs	1.00	.65
Workrite Variometer	3.50	2.99
Workrite Variocoupler	3.50	2.99
Workrite Headphones	8.50	7.00
Workrite Loudspeakers	12.00	10.00
3" Dials	1.00	.85
Rapco Phonograph Attachment	1.00	.79

CASH OR MONEY ORDERS WITH ORDER. RAPCO PAYS ALL PARCELS POST CHARGES.
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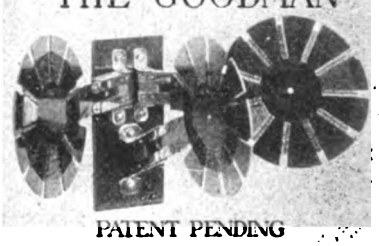
147 West 23rd Street, New York City, N. Y.

THE GOODMAN

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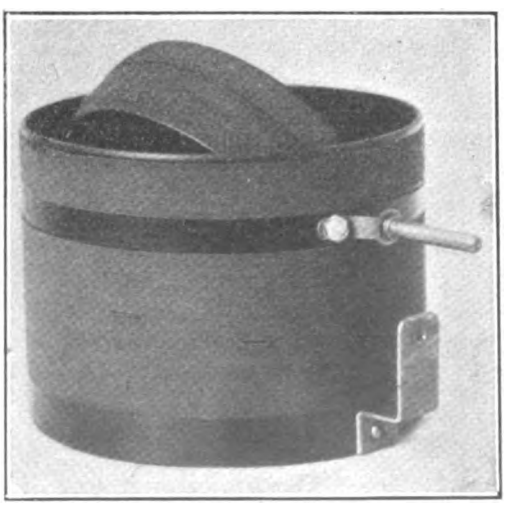
The Niftiest Short Wave Tuner on the Market Only $6.00 & PP on 1 lb. Send for pamphlet.
L. W. GOODMAN
DREXEL HILL, PA.
The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

TO GET THAT DISTANT STATION
USE A COAST COUPLER

This coupler is designed along strictly scientific lines, and is the result of eighteen months' experiment. Wound with green silk covered wire on Bakelite tubing. Very selective.

Following are a few of the many DX stations received with this coupler, and detector tube only, at Long Beach, California:

PWX, Havana, Cuba
WWJ, Detroit, Mich.
WSB, Atlanta, Ga.
WDAP, Chicago, Ill.
CFCN, Calgary, Can.
WBAP, Ft. Worth, Texas



Our adaptation of a popular hook-up furnished with coupler. Coupler fully guaranteed when hooked up according to instructions.

Coupler and diagram, sold only under our money back guarantee. Mailed anywhere in the United States upon receipt of $5.00. Post Office or Express money order.

Make All Remittances Payable to
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Large shirt manufacturer wants agents to sell complete line of shirts, pajamas, and night shirts direct to wearer. Advertised brand—exclusive patterns—easy to sell. No experience or capital required. Entirely new proposition.
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CRYSTAL SETS
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Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at $5.00.
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My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.
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2276-P Woolworth Bldg., New York City

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
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FRED S. CLARK, Secretary and Manager
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Managing Editor Stephen L. Coles
Technical Editor Robert L. Dougherty

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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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"Twice as Near Is Half as Far"

WORDS spoken in a public hall in Schenectady, N. Y., reached a radio listener in San Francisco, Cal.—2,550 miles away—before they were heard by a listener 150 feet from the speaker.

That statement looks a bit fantastic, but it is mathematically true. The apparent absurdity becomes reasonable when it is realized that the speed of sound is 1,126 feet per second at a temperature of 69 degrees Fahrenheit, and the speed of electrical vibrations, or radio waves, is 186,000 miles per second.

The listener in the back of the hall in Schenectady—150 feet from the speaker—heard the words in 0.1332 seconds.

A microphone connected to the radio transmitting equipment of WGY, the General Electric Company station, was two feet in front of the speaker, and picked up the words in 0.002 seconds.

Time required to transform sound waves into electrical energy, 0.002 seconds.

Time required for electrical vibrations or waves to pass from Schenectady to San Francisco, 0.0137 seconds.

Time required at receiving end to convert electrical vibrations into sound vibrations, 0.001 seconds.

Total elapsed time from the speaker in Schenectady to the radio listener in San Francisco, 0.0187 seconds.

Listener in hall heard words in 0.1332 seconds.

The period of time elapsing between the spoken word and its reception via radio, 2,550 miles away, can be illustrated as follows: 0.0187 seconds is time required for a spectator at a baseball game to hear the impact of bat against ball when he is standing twenty-one feet from the batter.

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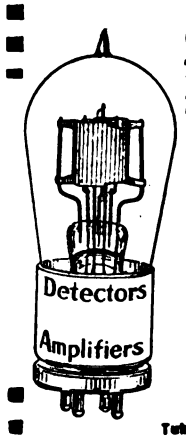

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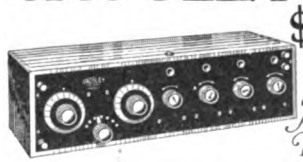
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RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

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THE ANNIVERSARY NUMBER of Radio World was increased in size and an exceptional issue. A few copies left at 15c. each, or you may start your subscription with that number. Radio World, 1493 Broadway, New York.

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RAND-McNALLY RADIO MAP OF UNITED STATES—Is 28 x 30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover. Price, 35c. The Columbia Print, 1493 Broadway, New York City.

Manufacturers' Representation Wanted

EDITOR, RADIO WORLD: The writer, with others, is forming a company to distribute radio apparatus and supplies in northeast Ohio and northwest Pennsylvania.

Can you place me in touch with manufacturers who would desire exclusive representation in the territory mentioned? Have manufacturers quote jobbers' prices, and give complete information necessary in first communication.

Yours very truly,

Coming Events

PERMANENT RADIO FAIR FOR BUYERS. Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

RADIO EXHIBITORS OF BROOKLYN, general exposition of radio apparatus and accessories. Signal Corps Armory, Dean St. and Washington Ave., Brooklyn, N. Y., April 23 to April 28, in-

Capsules Used to Protect Crystals in Shipment

A NOVEL idea has been put into effect by the Specialty Service Company, 552 Pacific Street, Brooklyn, N. Y., in the protection of their DX radio crystals during transit to purchasers. The crystal and a circuit diagram showing how to use the crystal set in connection with a supplementary tube are packed in a transparent capsule. This affords ample protection for the crystal and makes a package attractive in appearance. It is encouraging to find manu-

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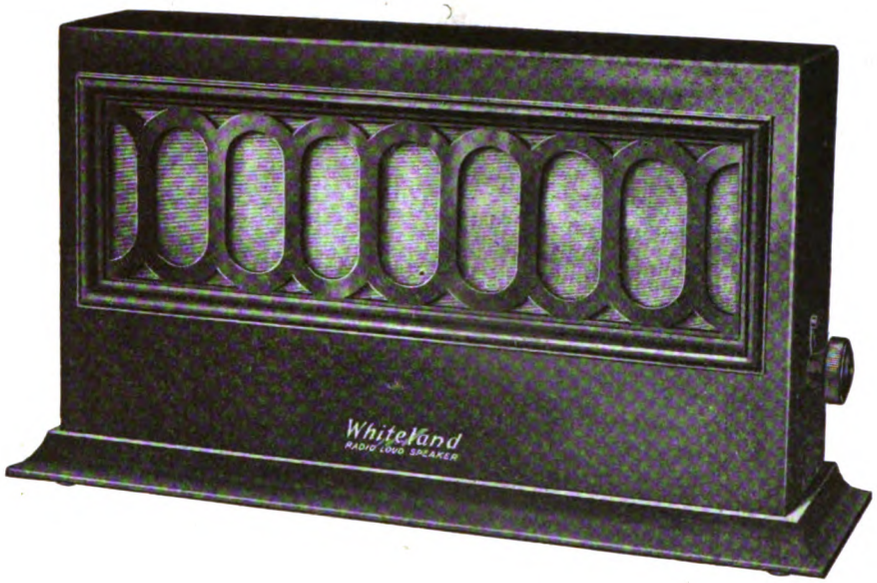

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The WHITELAND harmonizes with the furniture in the finest homes and its tone quality is just as superior as its looks.

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If the radio store in your neighborhood does not have the WHITELAND in stock, send money order direct to us and we will ship at once. If you are not satisfied with the WHITELAND return it and your money will be refunded.

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Write for the Whiteland Dealer Proposition

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Is Radio About to Be Revolutionized? (See Page 7)

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RADIO WORLD

Title Reg. U. S. Pat. Off.

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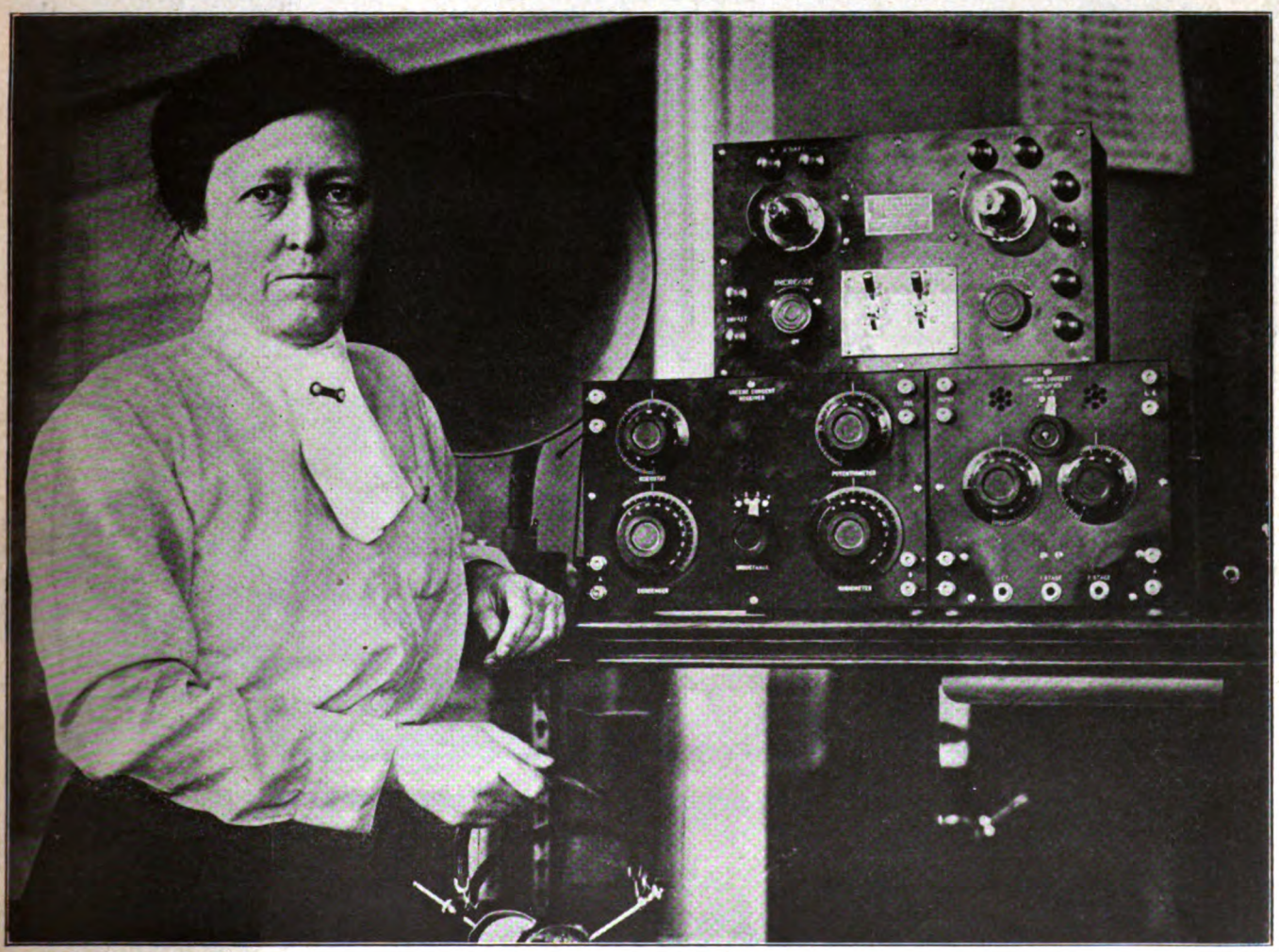

(C. Keystone View Co.)

This is Miss Rachel M. Thompson, of Boston, Mass., the only woman graduate of the radio school she attended and the holder of a first-class radio operator's license. She has wound armatures in a factory and has done machine tool work. Her favorite occupation is lecturing to boys on radio and other subjects.

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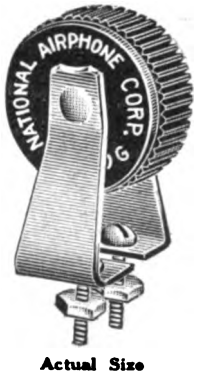

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YOU ARE PROTECTED BY THIS GUARANTEE

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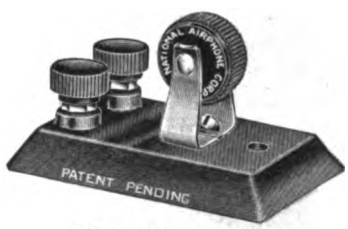

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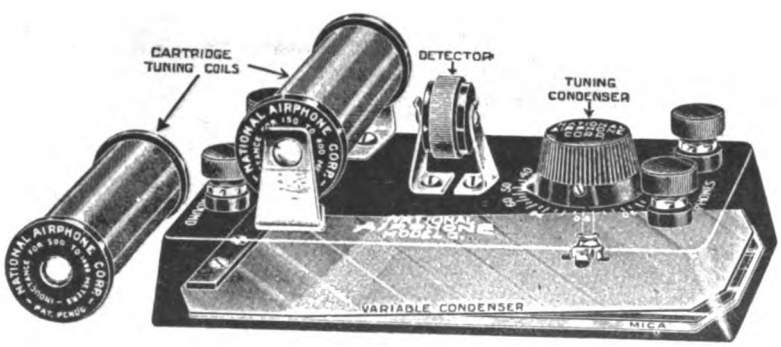

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VOLUME THREE OF

RADIO WORLD

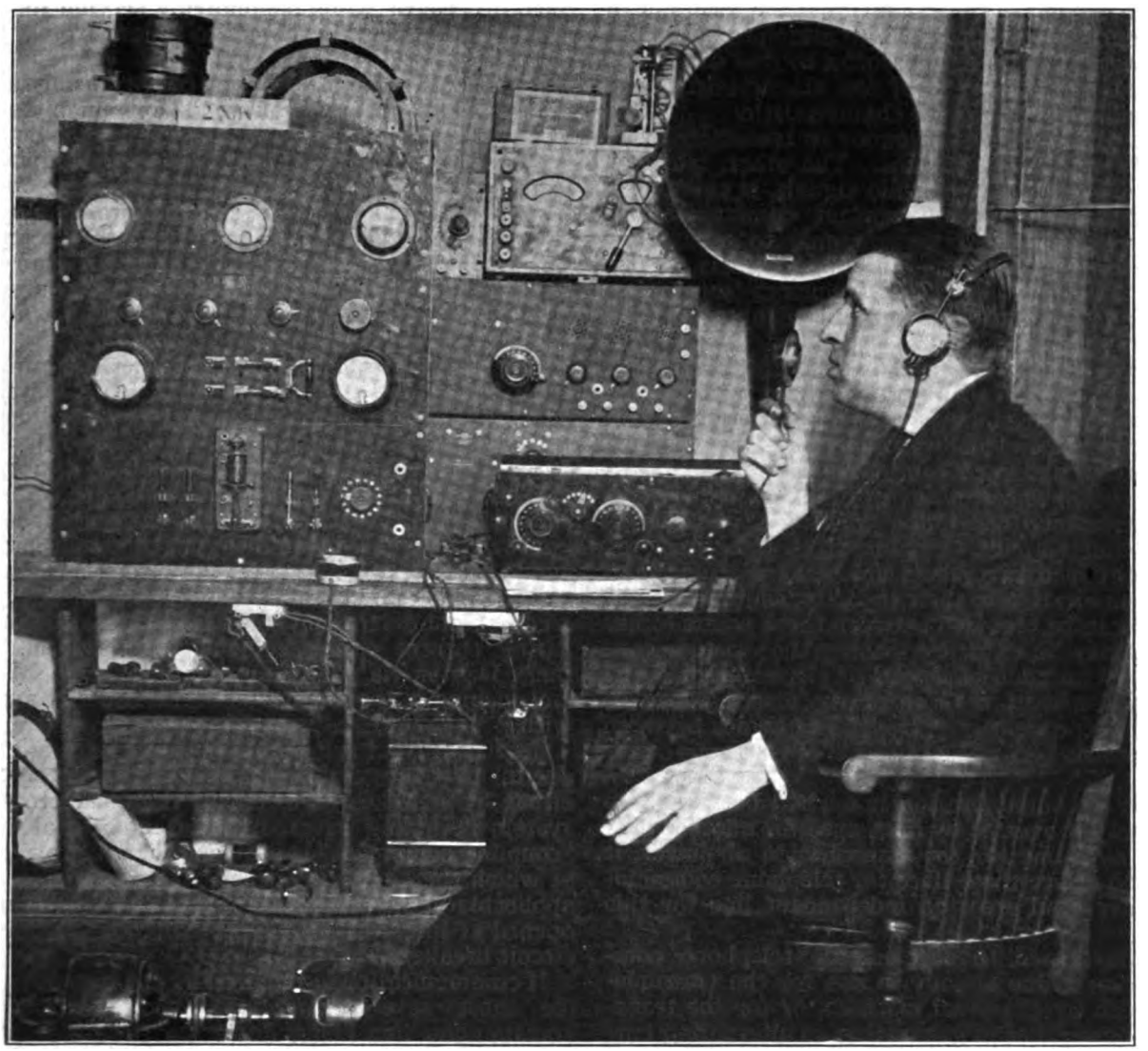
[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 5. Whole No. 57 April 28, 1923 15c. per copy, $6.00 a year

A Notable Member of Radio's Higher Circles

By William Silver



(C. Photonews, N. Y.)

Transmitting and receiving equipment of L. M. Cockaday, one of the prominent amateurs of the United States. Mr. Cockaday, who is operating his radiophone set, has just perfected a new four circuit receiver shown below his right hand.

ONE of the best known amateur radio stations in the United States is 2XK, operated by Lawrence M. Cockaday, and located at 1522 Jessup Avenue, New York City. It is a station that has done remarkable work in both telegraphy and telephony and has established several records in both for the other amateurs to shoot at.

The illustration shows the receiving and transmitting equipment of 2XK as well as its owner. The transmitter, situated on the left hand side of the table, is rated at 200 watts maximum, uses six tubes, (four 50-watt tubes and two five-watt), and can be used for either telephony or CW. Power for the plates is furnished by the motor-generator shown on the floor.

Mr. Cockaday has just perfected a four circuit tuner, shown directly to the right of the transmitter at the front of the table. With this receiver he has picked up stations all over the United States, Canada, Cuba, and Porto Rico. The circuit is at present a secret, because of certain technical parts that have to be brought to a higher standard of perfection before the receiver is really complete.

The regular receiving equipment is shown directly back of the new receiver.

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Features of Carrier Current Telephony

By B. R. Cummings

Radio Engineer, General Electric Company

IT is a matter of common knowledge that a single electrical conductor can be made to be a part of two or more electrical circuits and function in each circuit simultaneously. It is possible, for example, for a single conductor to carry both alternating and direct current, or two or more alternating currents of different frequency characteristics, simultaneously.

These currents do not exist independently in the conductor, however, and at any instant the current flowing is the sum of all component currents.

While the current in the conductor is the resultant of individual currents, it is possible to attach to such conductors suitable groups of apparatus, so that one group will respond to the current of one characteristic, and the other to that of the other characteristic.

This fact is somewhat analogous to transmission by radio at different wave lengths. The ether, which is the medium which conveys radio signals, is carrying a very great number of independent communications simultaneously, although we are able to adjust our radio receivers so that we can select signals at one frequency, and, with sufficient frequency separation, hear nothing that is being transmitted at other frequencies.

So that, while signals carried by wire are transmitted by conduction rather than by radiation, a conductor may be made the medium whereby a great number of signals having individual characteristics are carried simultaneously, and each can be received by appartus which is adjusted to select any of the incoming signals.

This phenomenon has found growing application in communication systems. For example, if a group of wire lines between two points are being used for telephone communication to their capacity, additional communication can be provided between these points either by erecting new lines, or by making the existing conductors carry an additional load of characteristics differing sufficiently from those of the existing load to permit its independent reception. The choice between the two methods becomes a question of economic selection.

Similarly, if communication is desired between two points already converted by lines used for another purpose, such as a line for the transmission of power, it is possible to utilize these lines for telephone communication, rather than erect an independent line for this purpose.

The method used to superimpose telephone communication on a line already in use for the transmission of speech by the usual methods, or for the transmission of power, lies in generating an alternating current of rather high frequencies, modulating it in much the same manner as the output of a radio transmitter is modulated, and coupling the generator to the line. At the receiving end, apparatus is used which somewhat resembles a radio receiver. This is also coupled to the line and tuned to the frequency of the communication current.

The system of communication which results is known as "carrier current telephony," a name derived from the fact that the communication is carried by the high frequency source rather than directly, as in the case of the usual telephone line.

Since radiation is almost directly proportional to frequency and since the frequencies used for carrier current work are comparatively low, a line utilized for carrier current communication radiates very little energy, and communication is carried on primarily by conduction. Such transmission, therefore, is fundamentally different from transmission by radio.

Carrier current communication has advantages over wire telephony in addition to the fundamental in that it can be applied to existing lines. For example, it is customary for power companies who maintain long transmission lines to provide for telephone communication between their various stations and sub-stations, by running wires either above or below the power lines. Such procedure, while undoubtedly serving its purpose to a certain extent, is subject to failure from a number of sources.

For carrier current telephony over transmission lines, the exposure to such failure is appreciably reduced. The carrier current telephone equipment is coupled to the transmission line by means of a capacitance in one form or another. The maximum exposure offered in such installations is that of one or more coupling wires strung for a length of 1,000 ft. beneath the transmission line. This is necessary at both the transmitting and receiving station. The physical exposure, therefore, is reduced to a negligible minimum when compared to the total length of the line.

The reduced exposure of the carrier system also results in its far greater freedom from disturbances which are usually encountered in telephone lines erected adjacent to transmission lines. This refers to induced noises, lightning disturbances and atmospheric.

While carrier current telephony require for successful operation a closed alternating current circuit, such a circuit may be maintained under conditions which would be fatal to a direct current circuit. One or more of the conductors of a transmission line may be severed without destroying communication, since the alternating current circuit remains operative so long as there is a single conductor left intact, or so long as any opening in the line has sufficient capacity associated with it to keep the alternating current circuit intact.

Carrier current telephony, however, will not be successful on a system if the line is completely opened either by switches or by all of the conductors in the system becoming severed, unless additional so-called "coupling equipment" is provided for bridging the point at which the circuit is opened. This provision is most applicable at points where the circuit is intentionally opened at intervals such as at switching stations or at circuit breakers.

If communication is required by the two points under the most severe conditions, such as the power transmission line being down for a considerable distance, straight radio is the only sure solution. One of the greatest advantages of carrier current telephony, however, lies in the fact that it is not radio equipment and the stations are not radio stations, and that, therefore, it is not necessary to obtain an operating license from the Department of Commerce and keep an operator on watch at all times.

Carrier current telephony on power lines can best be justified when the system is erected. If carrier current is used, no provision need be made for the erection of telephone lines. Since such provision is a matter of considerable cost, particularly in cases where provision for a telephone line would mean the erection of towers several feet higher than would otherwise be required, it is far more economical to install a carrier current communication system.

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Government's New Radio Regulations

FOR the benefit of all interested in radio broadcasting the following amendments to the radio regulations are reproduced as issued by the Department of Commerce recently:

To Radio Inspectors and Others Concerned:

Regulation 57, page 55, amended April 2, 1923, to read:

CLASS 2—Limited commercial stations are not open to public service, and are licensed for a specific commercial service or services defined in the license. Stations of this class must not transmit or accept public messages from other stations. No rates are authorized.

Licenses of this class are required for all transmitting radio stations used for broadcasting news, music, lectures, church services, government reports, and such matter, and do not permit the transmission of private or commercial communications.

The reading of telegrams or letters by broadcasting stations will not be construed as point-to-point communication so long as the signer is not addressed in person and so long as the text matter is of general interest.

Broadcasting stations must be operated by or under the supervision of an operator holding a commercial second-class license or higher; such operator must be on duty during the entire time the station is being operated.

No testing or experimenting is authorized in broadcasting stations between the hours of 10 a. m. and midnight, local standard time.

Broadcasting stations the operation of which interfere with the reception of time signals and meteorological information by marine service must remain silent while such signals are being transmitted.

Class "A" Radiotelephone Broadcasting Stations

Class "A" radiotelephone broadcasting station licenses will be issued to stations equipped to use power not exceeding 500 watts in the antenna, and will be assigned a wave length between 222 meters (1,350 kilocycles) and 300 meters (1,000 kilocycles).

Where more than one station of this class are licensed in the same city or locality a division of time will be required if necessary.

Class "B" Radiotelephone Broadcasting Stations

A license will not be issued for a station in this class which does not comply in every respect with the specifications hereunder.

Specifications covering the requirements governing the construction, licensing, operating and service of Class "B" radiotelephone broadcasting stations:

WAVE LENGTH—The wave lengths between 300 and 345, and 375 and 545 meters only will be assigned for the use of stations of this class, which must be free from harmonics. Whenever necessary the use of a coupled circuit transmitter will be required. Hereafter but one wave length within these ranges, including the 400 meters wave length, will be assigned to any one locality.

POWER—The power supply must be dependable and non-fluctuating. The minimum required will be 500 watts in the antenna and the maximum shall not exceed 1,000 watts in the antenna.

MODULATION—The system must be so arranged as to cause the generated radio-frequency current to vary accurately according to the sound impressed upon the microphone system.

SPARE PARTS—Sufficient tubes and other material must be readily available to insure continuity and reliability of the announced schedule of service.

ANTENNA—The antenna must be so constructed as to prevent swinging.

SIGNALING SYSTEM—Some adequate and dependable system must be provided for communication between the operating room and the studio.

STUDIO—The radio equipment in the studio must be limited to that essential for use in the room. The room shall be so arranged as to avoid sound reverberation and to exclude external and unnecessary noises.

PROGRAMS—The programs must be carefully supervised and maintained to insure satisfactory service to the public.

MUSIC—The use of mechanically operated musical instruments is prohibited.

DIVISION OF TIME—Where two or more stations of Class "B" are licensed in the same city or locality a division of time will be required if necessary.

Forfeiture of Class "B" Privilege

Licenses issued for the use of the wave lengths between 300 and 345 meters and 375 and 545 meters shall specifically provide that any failure to maintain the standards prescribed for such stations may result in the forfeiture of the Class "B" privilege and re-licensing of the station to use a wave length below 300 meters.

All radiotelephone broadcasting stations now licensed to use 360 meters (834 kilocycles) are placed in this class. No new licenses will be issued for stations to use this wave length. Renewal licenses for the use of 360 meters will be granted if necessary.

(Signed) D. B. CARSON,
Commissioner.

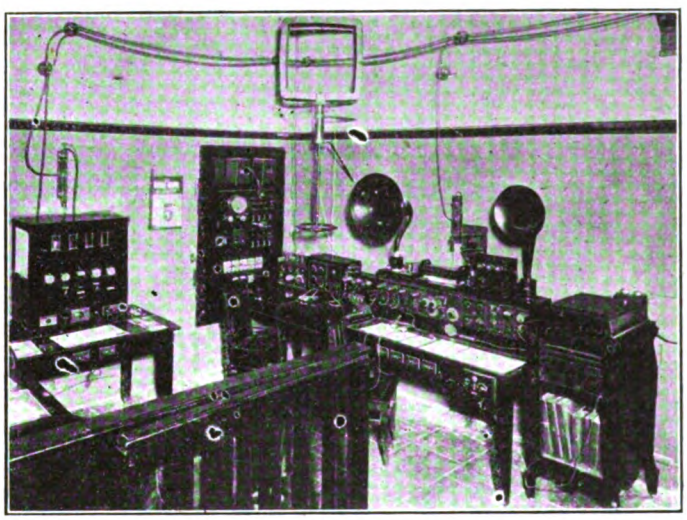
Approved:
(Signed) Herbert Hoover,
Secretary.

Combining Radio and Telephone

(C. Kadel and Herbert)

Many men, having found out how immensely important radio is in daily life, have installed radio receivers in their private offices, in order to get market prices first hand without waiting for ticker or paper reports. The particular office above is combining radio and the long-distance phone to circulate reports directly over the long-distance line between two offices of the same company.

A Cuban Broadcasting Station



(C. Kadel and Herbert)

Interior of the control and operating room of Station CG, Havana, Cuba. Of particular note is the complete and extremely powerful receiver, located on the table. Fans who think that they have a receiver when they use four or five tubes are invited to look at the 12 tubes used here, besides the power amplifier and additional two-stage radio-frequency when the loop shown in the corner is used. The transmitter control is directly next to the operator, and the transmitting apparatus is in the small case to the left of it.

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Allocation of New Wave Lengths for Class B Stations

Wave Lengths for Specific Stations Will Be Assigned Later

THE Department of Commerce issued last week the allocation of wave lengths for class B radio broadcasting stations published below.

The specific wave lengths indicated are in accordance with the plan sent to radio inspectors following the recommendations of the Second National Radio Conference. The radio inspectors have been instructed to communicate the plan to stations in their districts. Every station which the department has so far heard from has willingly fallen in with the plan. Of course, it is understood that any station now operating on 360 meters has the privilege of remaining on that wave length.

It is to be noted that assignments are for cities and not for specific stations.

Wave lengths marked "Reserved" are being held for localities in the zones where Class B stations do not exist at the present time.

Entertaining Fifth Ave. Crowds

(C. Kadel and Herbert)

Blasé New Yorkers were recently startled out of their usual complacency when they heard music and talking in the vincinity of the Public Library, apparently emerging from nowhere in particular. Upon closer inspection, the curious found that Miss Tinsler had equipped a tea wagon with a De Forest reflex set and a couple of loud speakers, and was taking a stroll accompanied by sounds of sweet music from WEAF and WJZ. Miss Tinsler and her Radio Go-Cart in front of the Public Library are shown here.

Allocation of Wave Lengths,—
Class B Stations, Operating and Pending

Zone 1.	Frequency Kilocycles	Wave Length Meters
Springfield, Mass.	890	337
Wellsley Hills, Mass.		
Schenectady, N. Y.	790	380
Troy, N. Y.		
New York City & Newark, N. J.	740	405
	660	455
	610	492
Philadelphia	590	509
	760	395
Washington, D. C.	690	435
Reserved — 303 — 319 — 469 — (357) — (288)		
Zone 2.		
Pittsburgh, Pa.	920	326
Chicago, Ill.	670	448
Davenport, Iowa	620	484
Des Moines, Iowa		
Detroit, Mich.	580	517
Dearborn, Mich.		
Cleveland, Ohio	770	390
Toledo, O.		
Cincinnati, O.	970	309
Madison, Wis.	720	417
Minneapolis, Minn.		
Reserved. — (294) — 345 — (366)		
Zone 3.		
Atlanta, Ga.	700	429
Louisville, Ky.	750	400
Memphis, Tenn.	600	500
St. Louis, Mo.	550	546
Reserved. — 300 — 316 — (353) — 375 — 462 — 333.		
Zone 4.		
Lincoln, Neb.	880	341
Kansas City, Mo.	730	411
Jefferson City, Mo.	680	441
Dallas, Texas	630	476
Forth Worth, Texas		
San Antonio, Texas	780	385
Denver, Colo. (Reserved)	930	323
Omaha, Neb.	570	527
Reserved. (361) — (291) — 306		
Zone 5.		
Seattle, Wash.	610	492
Portland, Oreg.	660	455
Salt Lake City, Utah	960	312
San Francisco, Calif.	590	509
	710	423
Los Angeles, Calif.	760	395
	640	469
San Diego, Calif.	560	536
Reserved. — (297) — 330 — (349) (370).		

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Will the Freeman Tube Revolutionize Radio?

By Arthur S. Gordon

[The prophecy put forth by the writer of this article is, of course, conjecture; but it is based upon a conviction that the advent of a practical alternating current tube will bring a radio receiver to the stage where it can be connected with a household electric lighting fixture, as a vacuum cleaner or an electric iron is now attached. Does the Freeman tube hold this promise? Will it revolutionize radio? The writer presents the facts as he sees them—RADIO WORLD readers may draw their own conclusions. The Freeman tube, the author says, has been successfully tested and used with alternating current and the theory of its operation is sound. The writer has gone a step ahead and indicated the possible future of a tube with the characteristics of the Freeman device.—Editor, RADIO WORLD.]

WILL the vacuum tube newly evolved by Mr. H. M. Freeman revolutionize the radiophone industry? Radio engineers who have examined the features of this new tube say that it makes possible the dream of the vast radio public for a receiver which will operate by being connected to an electric lighting fixture, much as a lamp, or a flatiron, is connected now. No other outside helps will be needed excepting a "B" battery. The lighting wires will not only furnish the power with which to light the filament of the tube, but they will also furnish the aerial. A ground, it is thought, will not be necessary.

An extra element in the Freeman tube not found in the standard tube makes all this possible. The ordinary three-element tube contains a filament, a grid and a plate. The Freeman tube has a fourth element, consisting of a nickel tube, which entirely surrounds the filament, which in this case is made of ordinary tungsten. This nickel tube or sleeve is coated with electron-producing oxides, of barium and strontium, which, when heated to a proper temperature by the filament, give off the electrons for the operation of the tube. The filament is thus relieved of this duty, and is used only as a heater for the separate electron-producing element. Because the flow of electrons is not dependent upon the quality of the filament current, it is possible to light this filament with alternating current, without that persistent and annoying hum so noticeable when ordinary tubes are used in the lighting circuit.

A step-down transformer is used, of course, with an output of six volts as reduced from the input of 110 volts. The grid and plate are the same as in other tubes and perform the same functions. When used with the present regenerative circuit, the Freeman tube is connected up as shown in the accompanying hook-up. Note that the nickel sleeve over the filament is connected to the minus post of the "B" battery. This is so that it can carry out the work of the filament in its electron-producing function. Observe also that the filament is in a separate circuit and has no connection with the remainder of the set other than to heat the nickel sleeve.

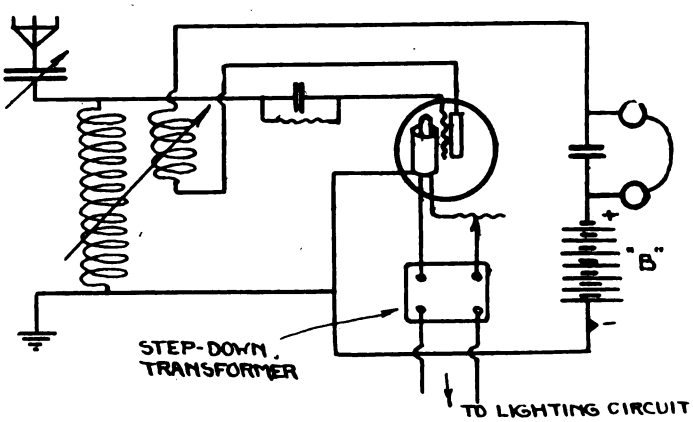

Diagram illustrating how the Freeman tube will be operated from commercial lighting circuits. A separate nickel-oxide-coated plate is heated by the filament. The nickel plate is depended upon for the electronic flow, instead of the filament, as is now the practice.

The Freeman tube is not yet on the market in commercial quantities. It is expected to capture the trade of the amateur from one end of the country to the other. It marks a distinct step in the evolution of the science.

Hints to Amateur Workmen from an Old Hand

STUDY your drawings with the greatest care. Learn to read them and understand just what they mean. This is the secret of rapid, efficient and satisfactory work. Be sure you understand both drawings and specifications before you touch a tool. An observance of this rule will not only save time but prevent the waste of material and temper.

"Order is Heaven's first law." Nature is the best example of the truth of this saying. Have a place for everything and keep everything in its place. This means not only tools, but material such as screws, nuts, bolts, connectors, binding-posts—in fact, all small parts.

Perform every task to the best of your ability—as if it were the only chance you would ever have to do this particular bit of work and do it right. "That's good enough" has no place in the good workman's vocabulary.

"It's a poor workman who complains of his tools." Many amateurs cannot afford a full set of tools and therefore are obliged sometimes to make one tool do the work of several. It is surprising how few tools are required.

Neatness and care in every operation performed will pay big dividends in results. Good work cannot be hurried even by a skilled mechanic. The principal advantage a professional workman has over the amateur is due to experience. After you have drilled as many holes as the man in the shop around the corner, you may be able to drill as many per hour as he; but if you take plenty of time, you can do each job now as well as he can.

Especial care should be exercised in making electrical connections and in following directions explicitly wherever they have to do with parts which transmit electric current. A half-soldered joint, a poor electrical contact or using too much flux when soldering will cause the failure of the best piece of electrical apparatus ever built.

When designing a panel, lay it out on paper first. This is a good way to save material—and disappointment.

Keep your tools sharp and clean. An oilstone, a rat-tail file and a three-cornered file are sufficient to keep your tools in first-class working order. All tools, especially those not in constant use, should be wiped at least once a week with an oily rag. This prevents rust—the sign of a careless workman.

Clean up the dirt and chips when you have finished work. This prevents a possible fire hazard, helps your standing with the family and gives a personal satisfaction such as can be enjoyed only by one who has learned to do things.

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Latest Broadcasting Classifications and Regulations Issued

WASHINGTON, D. C.—Official orders from Secretary Hoover have gone forward to the nine radio districts directing each inspector to put new radio broadcasting classifications into effect immediately as far as is practical.

New regulations provide for the allocation of the nationally exclusive wave length to all Class B or high-powered broadcasting stations and the distribution of wave lengths within the band 222 to 300 meters in each district to the Class A stations before May 15. At noon on that date, general broadcasting on 400 meters will cease, the transfer to new wave lengths being made. Such Class A stations as desire to continue to broadcast on 360 meters may do so in the new class designated as C, but no new licenses will be issued on 360 meters.

Radio, Restless Mystery

By Will Chamberlain

I HAD not dreamed that quiet atmosphere
Screened lips of such surpassing song,
I had not known that love and hope and fear
From hearts afar could this same stillness throng.

I had not dreamed that oratoric pleas,
Peak-touching flights of forums otherwhere,
Could flash, as on a silver-pinioned breeze,
To me across the ocean waves of air.

But now I know, and knowing, pause to think.
O restless hand that picks from sky and cloud
The gems of mystery, and with them spaces link—
You have high fellowship with God!

Stations now listed in Class A which can qualify in Class B, may be transferred upon application to local inspectors. No new licenses will be issued until all old stations receive their new waves, although several applications are on file at the department.

Hereafter all Government reports will be sent out on wave lengths assigned to the station and the exclusive use of the 485 meters wave length will be discontinued for this service.

The thirty Class B stations, all now operating on 400 meters, will virtually become national broadcasters, since with exclusive waves they should reach every corner of the country. To-day 15 states and 21 cities have B stations. In seven localities more than one station exists. This is true in Philadelphia which has four stations, and also in New York, Atlanta, Kansas City, Detroit, San Francisco and Los Angeles each of which has two. In these cities time will have to be divided as is done to-day on 400 meters. Philadelphia, New York, San Francisco and Los Angeles, however, will share four additional wave lengths it is understood.

Specific wave lengths have not been announced by Secretary Hoover collectively, but it is understood that each radio inspector will announce those in his district as soon as they are assigned.

Several wave lengths have been reserved for such new stations as may qualify or transfer from Class A. It is believed that Arlington, NAA, will change from 710 meters to a commercial wave of 435, and that when the new R C A station at Washington is licensed, it will receive an independent wave, since NAA is busy almost continually. Special waves will probably be given also to the new General Electric Company stations planned, one near San Francisco and one between Schenectady and the Pacific Coast, both of which will be high-powered stations.

Class B Station Distribution

California—	
Los Angeles, Earle C. Anthony	KFI
Los Angeles, Times Mirror	KHJ
San Francisco, Hale Bros., Inc.	KPO
San Francisco, Mercantile Trust Co.	KFDB
Georgia—	
Atlanta, Constitution	WGN
Atlanta, Journal	WSB
Illinois—	
Chicago, Westinghouse Elec. & Mfg. Co.	KYW
Iowa—	
Davenport, Palmer School of Chiropractic	WOC
Kentucky—	
Louisville, Courier-Journal & Times	WHAS
Massachusetts—	
Springfield, Westinghouse Elec. & Mfg. Co.	WBZ
Michigan—	
Detroit, Free Press	WCX
Detroit, News	WWJ
Minnesota—	
Minneapolis, Cutting & Washington Radio Corp.	WLAG
Missouri—	
Kansas City, Star	WDAF
Kansas City, Sweeney School Co.	WHB
St. Louis, Post Dispatch	KSD
New Jersey—	
Newark, Bamberger & Co.	WOR
New York—	
New York, American Tel. & Tel. Co.	WBAY
New York, Western Electric Co.	WEAF
Schenectady, General Electric Co.	WGY
Troy, Rennselaer Polytechnic Inst.	WHAZ
Oregon—	
Portland, Oregonian	KGW
Pennsylvania—	
Philadelphia, Gimbel Bros.	WIP
" Lit Bros.	WDAR
" Strawbridge & Clothier	WFI
" Wanamaker	WOO
Pittsburgh, Kaufman & Baer Co.	WCAE
Tennessee—	
Memphis, Commercial	WMC
Texas—	
Dallas, News & Journal	WFAA
Fort Worth, Star Telegram	WBAP

In a letter to all inspectors, Secretary Hoover points out that all broadcasters must stick to the new individual waves if interference is to be eliminated. His instructions follow:

"Under the reallocation of the wave lengths plan, effective May 15, 1923, it will be necessary for all transmitting radio stations to be accurately adjusted to the wave length specified in the license.

"Any variation from this rule may be considered a violation of Section 2, Act of August 13, 1912, justifying the revocation or suspension of the station license.

"Beginning May 15 radio inspectors of each district will carefully check the transmitting wave lengths of stations in their districts by personal inspection of the stations as far as practicable and by listening in with accurately calibrated receivers, and report to the department promptly any discrepancies observed.

"The Bureau of Standards will transmit standard wave lengths from time to time, which will be helpful in determining accurate wave lengths, and will also listen in and check the wave lengths being used."

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Dr. De Forest's "Speaking Flame" Eliminates Vibrating Diaphragm

DR. LEE DE FOREST announces that he has realized the dream long held by telephone engineers, namely, the translating of sound waves in the air directly into electrical currents, thereby eliminating the vibrating diaphragm.

An entirely new form of microphonic device has been evolved by the inventor. It is a "speaking flame," which gives promise of revolutionizing the present methods of transmitting voice sound waves into electrical waves and without the distortion associated with the older methods of voice transmission. The field of immediate application of the talking flame device is not only in the province of the talking motion picture film, but in the world of radio as well, and especially in those stations used for broadcasting the human voice.

"In response to numberless inquiries of scientists, educators, engineers and others directly interested in the development of the talking motion picture art," says Dr. de Forest in a statement issued by the De Forest Laboratories, "I should like to take this occasion to announce that as a result of my development of the new phonofilm my investigations and experiments have resulted in revealing what I consider will be another revolutionary step forward in the transmission of the human voice or sound through space. The advance itself may be regarded as a technical one from the engineering point of view, and yet from the benefits to be derived from the world at large the improvement is somewhat marvelous in that by means of it hereafter we shall be enabled to change voice or sound waves directly into electrical energy.

"It has for a long time been realized by telephone and acoustic engineers that the necessity for a diaphragm at the transmitter introduces at the very outset of the sound translation problem a source of distortion and imperfection. It is the diaphragm more than any one element which introduces the deformation in recording and in reproducing voice and music on the phonograph as well as in telephone transmission. Therefore, for many years efforts of telephone and phonograph engineers have been devoted to reducing as far as possible distortions thus introduced by the natural period of vibration of the diaphragm, or membrane, against which the sound waves impinge.

"But where exact and accurate translation of sound waves into electric currents is desired it is quite unnecessary to use a vibrating diaphragm. The discovery of the audion first came to me as a result of observation of a sensitive gas flame. From this rudimentary idea, which originated in 1900, was developed, during the ensuing five years, the three-electrode vacuum tube which was destined to become the telephone repeater or amplifier for which telephone engineers had been vainly searching for twenty years.

"And now in exactly the same way has been evolved a new form of microphonic device, which turns sound waves in the air directly into electric currents. Take the ordinary bat-wing gas burner or a certain form of Welsbach mantle gas light, or special forms of oxy-acetylene gas flames, insert two heat-resisting electrodes therein, in proper relation to the flame and to each other, connect these electrodes to an appropriate electro-motive force. You will then have an extremely sensitive sound converter which gives an electric reproduction of the sound waves in the air enveloping the flame which is of an entirely different order of fidelity from that ever obtained from any form of microphonic device, using a diaphragm, whether this be of the carbon, electro-magnetic, or electro-static variety.

"But I have found still another method of translating sound waves direct into electric currents without the imposition of any diaphragm. This arrangement, independently suggested to me by Mr. Theodore W. Case, is the reversal of the well known 'thermophone,' a device wherein an extremely fine platinum wire, through which is passed telephonic currents, reproduces these in the form of sound waves due to the alternate heating and cooling of the air immediately surrounding the extremely fine wire."

(C. P. & A. Photos)

Dr. Lee De Forest and his "speaking flame" device.

An Aerial Problem to Solve

BELOW, fellow fans, is a problem and a common one in these days; but this specific instance makes it stand out above all others of its kind.

On top of a certain apartment house in New York City, there are located no less than 23 aerials, of all shapes, sizes and form, some of them running just a few inches above the others and forming a veritable cage of wires. The roof of the house is large and there is plenty of space to put them up. The trouble is not in the erecting of the antenna, or anything of that sort. It is that out of the 23 there is only one that is not a regenerative set, and that is a humble crystal set, which due to re-radiation does nearly as good work as the one-tube sets in the house.

The trouble is that of the 22 other owners, there is not one who can properly tune in a station, even though it be WJZ, without squeals and howls, not only in his set but in the sets of all those around him. It is impossible to listen to DX work before 1 a. m. because up to that time all the other sets are persistently squealing and howling into one another's ears, and making the air sound like a pig sty when there is a particular fight going on.

The problem is how can this be eliminated, and at the same time give satisfaction to the owners of the sets?

Don't say "Cut out the regenerative sets," because they are all expensive and up to date.

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Radio and the Woman

By Crystal D. Tector

WELL, well, I certainly woke up a lot of my women readers when I published the request to send in DX notices. I have not the space to publish them all, but here's the best one, from Mary Devoux, way out in Sacramento, California. She writes me a nice little letter and tells me that she hears the following stations regularly on her brother's two tube set, which was made in the cellar of the house. Her farthest distances are Davenport, Iowa, station WOC, and Fort Worth, Texas, WBAP with the following in-between stations: KDYY, Denver, Colo.; KDYL, Salt Lake, Utah; KDYW, Phoenix, Ariz.; KYJ, Los Angeles, Cal. Now girls, don't be backward about coming forward, as when I get enough "lady DX'rs" I am going to ask the editor to run a Lady DX page and publish all the reports of the girls who read RADIO WORLD and listen in.

* * *

We were invited to a birthday party in Brooklyn last Sunday. At about 8 o'clock the guests filed into the parlor and were agreeably surprised at the sight of a beautiful radio set of ample proportions. In a few minutes we heard the strains of a popular dance tune and of course the crowd lost no time getting coupled up for the light fantastic. Needless to say, the party was an unquestionable success and we have an inkling that this crowd one and all will find an excuse to visit the apartment of Mr. and Mrs. B. very soon again.

* * *

French-speaking residents of Canada are learning English from the announcers of WGY, according to a letter received recently by the Schenectady radio broadcasting station of the General Electric Company. Mrs. R. Normandin, a resident of Shawinigan Falls, Quebec, writes: "Many persons are taking advantage to learn to pronounce English, especially from your station. Our daughter, aged four, speaks French only, and she startled us recently when she said all of a sudden "WGY, Schenectady, N. Y., one minute please." Those in charge of the radio broadcasting activities of the General Electric Company realize that the right to broadcast carries with it the responsibility to offer something worth while. An earnest and conscientious effort is made to provide good music, to give variety of entertainment and to give helpful addresses. Announcers strive to pronounce all words correctly. Before an announcement is made or an address delivered, the announcer goes over the manuscript, and if he is in doubt about the pronunciation of a word he looks it up. The announcer knows that his audience is made up of those who may copy his pronunciation and those who may criticise the slightest slip. He therefore has two reasons for accuracy.

* * *

A friend of ours who started in to study the code over the radio has become quite proficient, and can now copy the amateurs around town, with the exception of one station that sends fast no matter who he is talking to. He must use what they call a "bug" key because he certainly is a "bug." When it comes to sending he sounds like a Ford when a woman is driving it up hill and can't keep her foot on the gas steady. Slow—fast—stop—slower, fast—faster—all balled up—repeat—then he waits and has to repeat it because no one can understand him. Wish he would learn how to send. I live just two blocks away from him and like to listen to the "hams" once in a while, but he simply spoils all my aspirations to copy them. I think a good idea for some of those speed hounds would be to tame themselves down until they send distinguishable copy and then pick up speed gradually.

Radiograms

The electric central stations of the United States are planning extensions and additions in 1923 which will cost more than six hundred million dollars.

* * *

Marion Davies, the movie actress, thinks that radio will eventually be used to acquaint people all over the country with events of importance transpiring in the motion picture world.

* * *

Dance music will be broadcast by WGY, the Schenectady radio station of the General Electric Company, every Saturday evening from 9 to 11 o'clock for a period of about six weeks. The music will be supplied by Cain's Castle orchestra. The WGY studio will be connected to the dance hall by wire.

* * *

A letter signed "Patients of the Vermont Sanatorium" was recently received by WGY, the General Electric Company broadcasting station at Schenectady, N. Y., acknowledging the pleasure and entertainment they get from the radio programs. The sixty patients are suffering from incipient tuberculosis and most of them depend upon WGY for the Sunday religious services. They wrote that they get the 7:45 p. m. concert, but have to be tucked into bed at 8:30.

* * *

Frank Smithson, the stage director, has been at work on a plan for radio entertainment on behalf of the Wired Wireless Corporation, a subsidiary of the North American Company, which Smith calls the "Theatrome," coined from "theatre-at-home." The Wired Wireless company is installing a large number of receiving sets on Staten Island, New York, to test its system of wired entertainment, before attacking the metropolis. This demonstration will test the practicability of General Squier's devices for receiving music and entertainment over the regular house lighting electric system.

The chemical faculty of the University of Chicago is soon to broadcast chemical lectures by radio.

* * *

Construction of a radio station, claimed to be the second largest in the country, has been started at Hialeah, near Miami, Fla., by the Tropical Radio Telegraph Company. The plant is to handle South American, Central American and West Indian business and will cost about $250,000. The towers will be 437 feet high with a span of 1,500 feet.

* * *

All London is in the throes of wireless telephony, according to W. E. Wroe, of San Antonio, Texas, who arrived last week in New York after a long stay in England. One of the novel uses to which the new marvel has been put is the radio sandwich man, who parades up and down the Strand and Piccadilly with a complete radio outfit. He is able to pick up all the stations, and all passers-by get an earful.

* * *

From Georgian Bay, Canada, WGY, Schenectady, N. Y., has received one of those letters which help radio station personnel and artists feel that their efforts are relieving the sum total of loneliness in the world. L. E. Monck, on Wahsoune Island, Sans Souci, Ontario, Canada, writes: "We are all very much attached to the program of WGY, and, best of all, the night devoted to the WGY players, as this class of entertainment takes us back to the cities and bright lights, and for the duration of the play we forget we are alone on one of the 30,000 islands of Georgian Bay, and, for weeks at a time, cut off from all communication with the rest of the world. Our nearest winter post-office is Parry Sound, eighteen miles away; and when the ice is too thick to use a boat and not thick enough to walk on we just stay here and hope for good ice so as to be able to get out, either with dog-team or horse, to get our mail. Just now the ice is good, and we make the trip every eight or ten days, but soon now the ice will start to break up, and then we are marooned until it is clear enough for a motor-boat."

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Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained in Simple Language for the New Radio Enthusiast

By Lynn Brooks

RADIO: The transmission and reception of signals or vocal sounds through the ether, without the use of conducting wires, by means of high frequency electric waves. In radio telephony, these waves are modulated by means of suitable transformers, the speaker talking into a microphone, where the propagated waves are modulated to conform to the variations of the human voice. In radio telegraphy the propagated wave is formed by means of a spark jumping across a space.

* * *

AERIAL (antenna): A system of wires used to collect energy transmitted through space. They are divided into different types, such as inverted L, T, and fan, each getting its name from its appearance. The L antenna, or aerial, is constructed so that the lead-in is taken off one end, generally the end nearest the apparatus. The T aerial is constructed so that the lead-in comes off the center, giving the appearance of an enlarged letter T. The fan antenna is constructed so that the wires radiate, after the manner of the leaves of a fan, spreading from a central pole with the lead-in taken off the converging point of all the wires.

* * *

GROUND: A means of dissipating the received energy after it has done its useful work in going through the circuit. It generally consists of a wire attached to a cold water pipe, or a pipe driven into the earth. The ground wire should not be any smaller in diameter than the sum total of diameters of the wires used in the antenna where a transmitter is concerned; but for receiving, it may be a single wire about No. 12 or 14 in size.

* * *

INDUCTANCE COIL (tuner): A number of wires wound on a suitable core, such as a round tube. They can also be made in various other forms, such as honeycomb coils, spider web coils, pancake coils. In the first, the straight inductance coil, the wire is wound contiguously in one single layer. This has been found to be quite inefficient, because such a coil possesses "distributed capacity," or capacity between one turn and its neighbor, with the insulation of the wires acting as the insulating plate. The honeycomb coils are wound in such a manner that all the turns are spaced, and in winding they cross one another at an angle. Such a coil can be built up to very high inductance values, taking but little space, and having a very low distributed capacity. Spider web coils are wound on a "former" resembling the spokes of a wheel, the wire weaving in and out. In the pancake coil the wire is wound spiral-wise, one layer on top of the other, in the form of a continuous spiral.

* * *

FIXED INDUCTANCE: A coil, the inductance of which cannot be varied. Honeycomb coils and spider web coils come under this classification.

VARIABLE INDUCTANCE: A coil, the inductance of which can be varied through the agency of either taps or sliders.

* * *

NON-INDUCTIVE RELATION: Coils placed in such a manner that a current passing through one will not induce a similar current in the other. This can be done by placing the planes of the coils at right angles to each other.

* * *

CRYSTAL DETECTOR: A rectifier of the received radio-frequency signals which makes them audible in the phones. As the received signals are alternating current, they would not make any impression on the diaphragms of phones. The crystal in the detector allows only one-half of the current cycle to pass. It is by nature a unilaterial conductor and allows the current to pass in only one direction, making a direct current out of the pulsating or alternating current. Without some means of rectification, the signals could not be made audible.

English Boy Wins First Prize

(C. Kadel and Herbert)
Master W. H. Hildersley, 15-year-old radio enthusiast, was awarded first prize at the Handicraft Exhibition, London, England, for making the best one-valve crystal combination radio set. The entire set was made by himself, with the exception of the tube and phones, and he has heard American phone stations in London on it. The illustration shows a local official listening in to American concerts on this home-made combination receiver.

TYPES OF CRYSTAL DETECTORS: Crystal detectors are of several different kinds, such as galena, carborundum, silicon, pyrites and numerous other minerals, some of which are elements. Others are synthetic, being products of the electric furnace or chemical reaction. Galena, the most popular, is sulphide of lead. It is bluish grey in color. Carborundum, which is a product of the electric furnace, is irridescent, the basic colors being purple and green. Silicon, which is an abundant element, is light steel grey in color and extremely hard. Silicon is also made in the electric furnace, by fusing silica with a small amount of pure carbon at extremely high heat. Pyrites is found in several forms, two of the most common used in radio work being iron pyrites (commonly called fool's gold) and copper pyrites (chalcopyrites). The first is a dull gold color and copper pyrites is dull brown or almost black in color. These last two are mostly used in connection with some other mineral to make a "perikon" detector, which is very sensitive. These minerals are among the most common in use.

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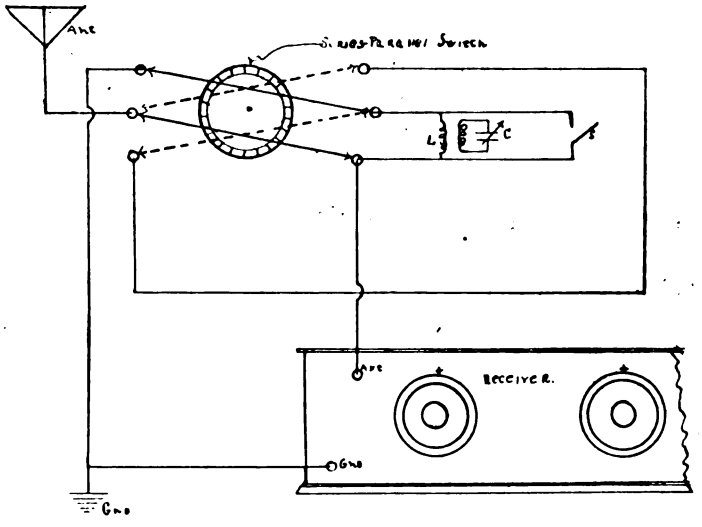
An Improved Wave Trap Filter

By C. White, Consulting Engineer

THE number of broadcasting stations is steadily increasing. If some method is not devised to secure greater selectivity within the wave bands that have been assigned for general broadcasting and amateur work, it will become extremely difficult for any one to get the station he wants without much interference. Especially is it true in the more densely settled cities, where it is now possible to hear two stations at the same time with a receiver that tunes rather broad. Although the solution of the problem is the construction and design of more selective receivers and circuits, still there are many who are perfectly satisfied with their outfits save for the lack of proper selectivity. The ordinary crystal detector outfit and the single circuit regenerative receivers, indeed, have been rather hard hit for selectivity in large and densely populated districts.

Then, again, there are many owners of radio-frequency amplifiers who are desirous of increasing the selectivity of their receivers, in order to cut out the local stations that are not desired when distant ones are trying to be tuned in. The wave trap filter is the logical solution of the problem.



How to hook up a wave trap filter with a series-parallel switch to obtain great selectivity.

A wave trap filter simply adds to the selectivity of the tuning circuit that is already on the receiver and, while it slightly cuts down the volume of the received signal, it certainly adds to the clarity by removing interference. The warm weather radio pest is greatly cut down by the use of filters, and it is possible to receive under many conditions with filters when ordinarily such a feat would require a more selective tuner with more amplification.

The filter illustrated is nothing more than a tuned coupled circuit. The inductance coil L and the variable air condenser C form the desired filter. The coil L can either be wound on a four-inch tube with 50 turns of number 22 D.C.C. magnet wire with a rotor having 40 turns, or a standard type of variocoupler can be used, employing the stator in the main circuit and the rotor in parallel with the condenser C. The latter is preferable since by changing taps on the stator and the coupling, the sharpness of the trap tuning subsequently can be readily altered in order to meet the requirements of the interference. The condenser C has a maximum capacity of .0005 micro-farads, which is the normal capacity of the average 23 plate air variable. The switch S is nothing more than a single knife-blade switch that is used to short out the filter while tuning in on the receiver. Under normal conditions of operations, S is kept open as illustrated. A series-parallel switch enables the filtering element to be thrown in series with the ground-antennae terminals of the receiver or parallel with these terminals, depending upon the nature of the interference that it is desired to eliminate. The series-parallel switch consists of six switch points and two switch arms which are rigidly attached to a knob. By moving the knob so that the switch arms take the position indicated by the dash lines, the wave trap is placed in series with the receiver and, by allowing them to remain in the position as shown by the solid lines, the wave trap is placed in parallel with the receiver. The ingenious amateur can mount his filter with the control switches in a little cabinet or incorporate it in the cabinet with his receiver if there is enough room inside and on the panel.

The operation of the wave trap is very simple. If it is desired to erase an interfering signal from a nearby station the blades of the series parallel switch should be so placed that the filter is put in series with the receiver. The switch S is closed and the desired station is tuned in; then S is opened and the condenser C and the coupling is adjusted until the interference is eliminated entirely or reduced to a minimum. Under certain conditions when the strength of the interfering signal is so strong that it is impossible to tune in the desired station on the receiver first, then it would be better to close S, tune in the interfering signal on the receiver, open S and move C and the coupling until the volume of the interference is a minimum. After this has been accomplished the receiver can be tuned to the wave length of the desired signal. Often it is wished to tune in one particular station when many other stations are interfering. Under such conditions we want to pick out one station from the midst of many who are operating around the same wave length, instead of eliminating one strong interfering station as explained previously. In this case the wave trap is placed in series with the antennae-ground terminals of the receiver by means of the series-parallel switch and short-circuiting switch S is closed. Again the receiver is approximately tuned to the signal of the desired station, S is opened and the series-parallel switch is then moved so that the filter is placed in parallel with the receiver. Then C and the coupling is adjusted until the signal desired is amplified to a maximum and the volume of those interfering will be greatly reduced or completely fall out of audibility. In the first place L and C were tuned to the wave length of the interfering station and, in the second, L and C were adjusted to the wave length of the desired station.

There is probably no small addition to your receiver which would be more useful and more fully appreciated than a filtering wave trap such as briefly outlined. With the use of this device a single circuit set is made almost equally as selective as the triple circuit regenerative receiver, which is generally considered paramount among amateur radio receivers for selectivity. There is generally just enough difference in wave length between the various broadcasting and amateur CW stations to allow the filter to function satisfactorily. Users of multiple stage radio-frequency amplification, which employs the standard type of radio-frequency transformers, have long been complaining of the poor selectivity they have been getting. While it was quite true that they could bring in the distant fellows, still their poor selectivity resulted in hearing many stations at the same time. The wave trap filter greatly aids to increase the tuning selectivity and by its use the owners of radio-frequency outfits can obtain better results.

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How to Make a Compact Universal Receiver

By W. S. Thompson, E.E.

IN designing the set described in this article, the author has tried to meet several specifications which are the outgrowth of the popular demand for a simple and compact receiving set that is really efficient and which can be constructed for a reasonable sum.

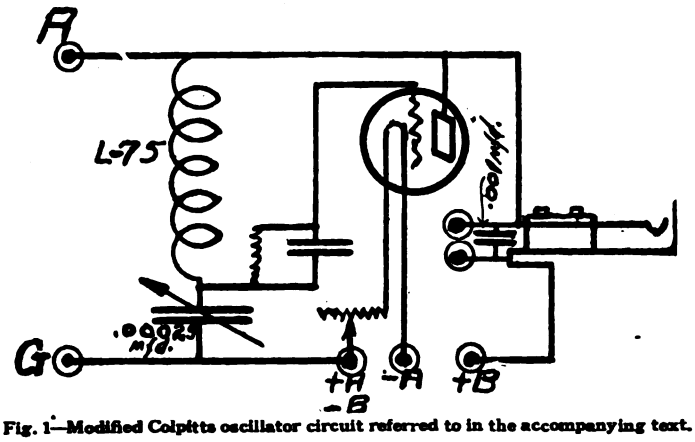

Fig. 1—Modified Colpitts oscillator circuit referred to in the accompanying text.

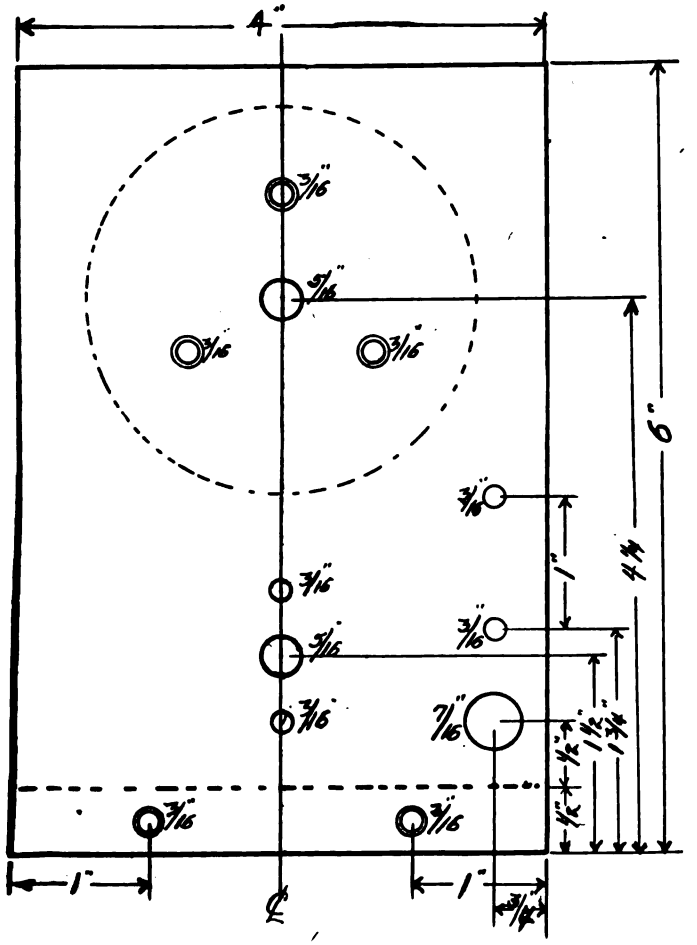

Fig. 2—Panel pattern used in making a compact universal receiver.

The electrical circuit which adapts itself very well to meet these specifications is the Colpitts oscillator, a modification of which is shown in Fig. 1. By using this circuit, regeneration has been incorporated although no additional control has been necessary, due to the fact that the regeneration can be controlled by the filament rheostat. The only tuning control that is necessary is a condenser, so the set as described can be very efficiently operated by the most inexperienced novice.

To eliminate all dead end losses and to make the set universal in its wave length range, a honeycomb coil with a standard mounting has been used for the inductance coil. In order to tune in to a higher wave length all that is necessary is to plug in a honeycomb coil with a sufficient number of turns to reach the desired wave length. The proper size coil to use can be obtained from the table published by the manufacturers of these coils. By calibrating the condenser dial for a number of different coils, a wave meter can be made of this set, the calibration holding true within a few per cent. for any antennae to which the set may be connected.

The author advises using a vaccum tube such as the WD-11, UV-199 or others of the same type, because a dry cell can then be used for the "A" battery, saving a considerable amount when purchasing the accessories and also saving considerable in the up-keep expenses. These dry cell tubes will be found to be ideal for use as a detector, especially when used in circuits in which regeneration is used.

Body capacity effects can be very easily avoided by connecting the rotating blades of the condenser to the ground binding post. By thus keeping the shaft of the rotor at ground potential, shielding by other means becomes unnecessary. Provision for connecting this set to an amplifying unit has been made by placing two binding posts on the panel. These binding posts should be connected in parallel with the jack as shown in Fig. 1. The jack used should be the special radio jack recently placed on the market, because it only extends back of the panel about an inch and allows the vacuum tube socket to be placed as near the panel as possible, thus conserving space.

The parts necessary for the construction of this set are listed below with average prices for each although the builder will probably be able to purchase them for less if he is a careful buyer:

Materials for Construction

1 Honeycomb Coil (75 turns)	$1.50	
I Variable Air Condenser (vernier) .0004 mfd.	2.50	
1 Filament Rheostat (vernier)	1.85	
1 Phone Condenser .001 mfd.	.40	
1 Grid Condenser with Variable Grid Leak	1.00	
1 Vacuum Tube Socket	.75	
1 Single Circuit Telephone Jack	.75	
1 Bakelite Panel 6"x4"x3/16"	.75	
1 Wood Baseboard 5"x4"x½"	.10	
5 Binding Posts	.25	
Wire for connections	.10	
Total Cost		$9.95

Accessories.

1 Dry Cell for Filament Lighting	.40	
1 B Battery	2.00	
1 Vacuum Tube (dry cell type)	6.50	
Total Cost		8.90
Cost of set with accessories		$18.85

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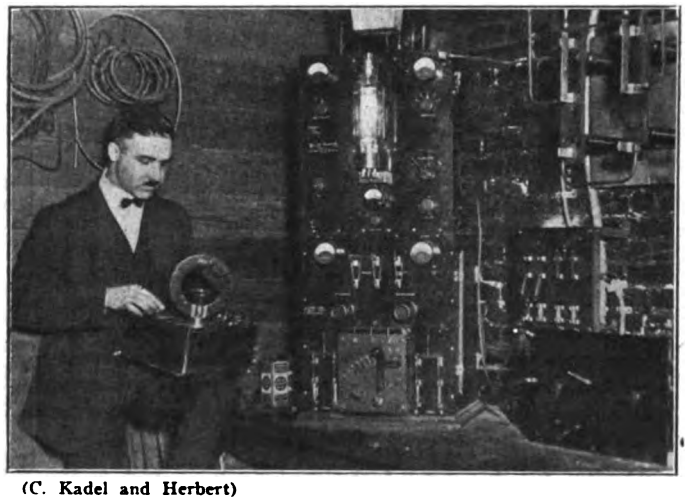
Testing a Church Broadcasting Station



(C. Kadel and Herbert)
Testing a broadcasting station for wave length.

That the recent popularity of radio broadcasting has left its mark on the churches of the country is testified to by the great number of churches which have adopted this method of spreading their services.

The latest addition to this growing list of stations recently made its debut under the call of WSAP. It is located in the basement of the church at 120th street and Lenox avenue, one of the more congested sections of New York City. It is, as shown in the illustration, a complete station in itself and does not rely on the retransmission of signals over land wires. The exact wattage of this particular set has not yet been determined, as it is only recently that it was installed.

It will operate on 360 meters wave length. The accompanying illustration shows Mr. E. H. Lee, United States Radio Inspector, testing the transmitter for wave length. Nothing is taken for granted in these days of radio congestion, so the radio inspector is a pretty busy man checking, rechecking and testing.

(Continued from preceding page)

After all the materials have been purchased, the builder should prepare the panel for mounting the apparatus by squaring off the corners with a file and drilling holes as shown in Fig. 2. The dimensions given can of course only be approximated for they will depend upon the make

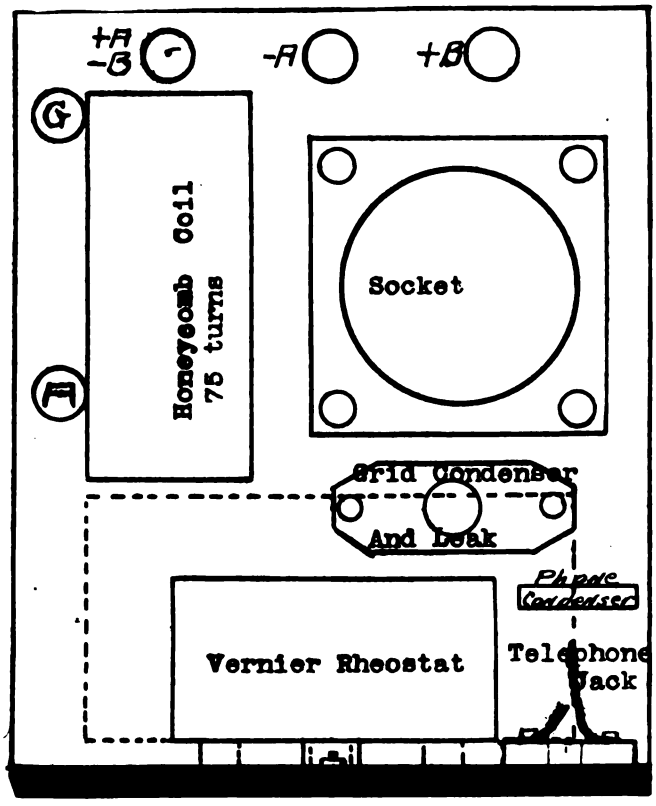


Fig. 3. Efficient arrangement of instruments on the baseboard of a compact universal receiver.

of the instruments purchased, so when marking the panel for drilling, the reader should be sure that holes for mounting screws are in the correct positions relative to each other. After all the holes have been drilled and those marked with double circles countersunk for flat head screws, the panel may be given a dull finish by rubbing it lengthwise with fine sandpaper until it is smooth. Repeating this process using a light machine oil and the sandpaper and then drying with a piece of cheesecloth, will give the panel a dull, permanent finish. The condenser, rheostat, jack and binding posts should be mounted on the panel following which the socket, honeycomb coil, grid condenser and binding posts should be mounted on the baseboard as shown in Fig. 3. The dotted lines in this figure show the outline of the condenser when the panel is fastened to the baseboard, care being taken that the socket and coil do not interfere with the condenser.

After having completed the assembly, the builder should wire the set using a heavy copper wire about No. 18 and soldering all connections. Connections to the various binding posts are shown in Fig. 1, binding posts being marked by small circles and lettered corresponding to binding posts marked in Fig. 3. The phone condenser can be mounted directly behind the telephone jack or between the two binding posts, provided for connecting the set to an amplifying unit. The phone condenser does not need any special mounting, being supported by the connecting wires which should be soldered to the terminals. When purchasing the phone condenser, the builder should be sure that the condenser has mica for the dielectric, and that its capacity will not change with change of atmospheric conditions. This can only be assured when the condenser has its plates firmly held together by a casing.

Before placing the tube in the socket and connecting the batteries it would be well to go over all the connections very carefully checking each one. This checking will often save a tube from being burnt out by excessive voltage, due to a misplaced "B" battery connection.

To place the set in operation, connect both batteries, ground and antennae to the correct binding posts and insert the tube turning up the filament rheostat until the filament is at its proper brilliancy. The tuning condenser should then be turned until some station is heard, the signal strength being regulated by the filament rheostat. If the rheostat is turned too far, the tube will oscillate, which will make the signals distorted if they are coming from a broadcasting station. A proper adjustment for the condenser and the rheostat will bring the station in loud and clear. After having found the combination which will give the best results, the value of the grid leak should be changed noting any improvement or any decrease in signal strength. The correct setting for the grid leak once found, will not have to be changed for a given tube, and hence it is not absolutely necessary to have a variable grid leak. The common type of pencil mark will work well after once determining the correct width and length for the mark. As this set is a so-called single circuit tuner the selectivity will not equal that of a set having coupled circuits, but if a short, low antennae is used, this fault can be remedied to a great extent. For receiving distant stations, this set will compare with any single tube regenerative receiver.

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Latest Radio Patents

Method of Neutralizing Capacity Coupling

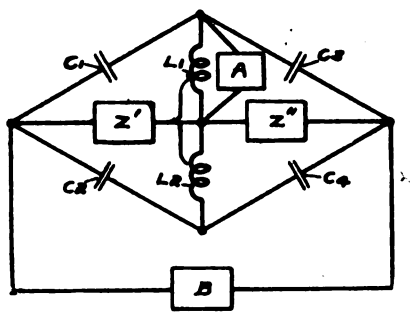
No. 1,450,080: Patented March 27, 1923. Patentee: Louis A. Hazeltine, Hoboken, N. J.

IT has long been known from practical experience that the presence of capacity coupling between the primary and secondary circuits of a radio receiver results in the transmitting of undesired signal oscillations, particularly those of short wave length, from the primary to the secondary circuit. This reduces the selectivity of the receiver and frequently prevents the reception of the desired signal, which is drowned out by a more powerful signal of a different wavelength. Two methods have been used to reduce the capacity coupling: first, the physical separation of the two circuits by as great a distance as is feasible; and, second, the partial enclosing of the circuits in metal screens. Neither method is entirely effective, for the first would require an impracticably wide separation of the circuits; while in the second the metal screens could not completely enclose the circuits as they would then prevent the desired magnetic coupling.

Again, it is well known that capacity coupling between the grid and plate circuits of an audion may result in the production of oscillations. Such oscillations are frequently very undesirable, particularly in audion amplifiers, as they may completely mask the signal which it is desired to amplify.

As a third example of the undesirable effects of capacity coupling, it has been found difficult to arrange a Wheatstone bridge for high-frequency measurements, due to the capacity coupling between the supply circuit and the detector circuit, which may result in a false balance and so vitiate the results of the measurements.

This invention is directed to the elimination of the undesirable effects of capacity coupling between two circuits such as are described in the foregoing examples. This is accomplished briefly as follows: An auxiliary circuit is provided which is electromagnetically coupled to one of the two original circuits which we will call the first circuit, and capacitively coupled to the other, or second circuit. If a disturbing voltage then exists in the second circuit, it will cause currents to flow both in the first circuit and in the auxiliary circuit, due to the capacity couplings. The electro-magnetic coupling between the auxiliary circuit and the first circuit is then arranged so that the magnetic effects of these two currents will neutralize



Professor Hazeltine's method of neutralizing capacity coupling by means of a special capacity neutralizer and balancing circuit. The principle is applied to his latest circuit to avoid oscillations.

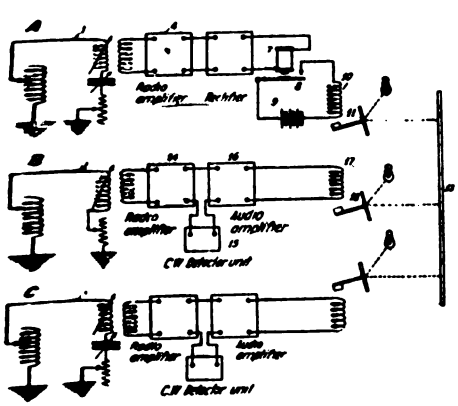
one another and so will result in no voltage across the first circuit. Conversely, if a disturbing voltage exists in the first circuit, it will result in no voltage across the second circuit, by the well known reciprocal properties of electric circuits.

The arrangement of the auxiliary circuit will depend on the forms of the original circuits. In some cases it is necessary to add coils or capacities to the original circuits to provide the required couplings, while in other cases the couplings may be obtained from coils present for other purposes or from inherent capacities.

Method and Means of Receiving Signals

No. 1,449,911: Patented March 27, 1923. Patentee: R. H. Ranger, Brooklyn, N. Y.

THIS invention relates to methods and means of receiving signals, and is more particularly useful in connection with wireless telegraphy, though it is not limited thereto.



Method of reception of radio signals to eliminate atmospherics and interference.

It is well known that atmospheric disturbances, commonly called "static," interfere with reception of radio telegrams, as the currents generated in the receiving systems by such disturbances blend with the signal currents and render the message more or less indistinct and, quite frequently, wholly unintelligible. There have been many attempts to overcome the effect of these disturbances, and, while some of these have been more or less successful, nevertheless there are times when static disturbances seriously affect the reception of radio messages.

My invention relates to the combination of several receivers, all working on the same signal, but each receiver having some essentially different characteristic such as in respect to directional properties, different location, damping, type of detector, type of receiver, etc.

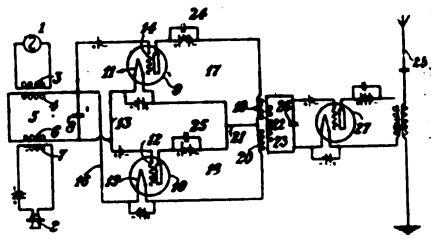
The messages received through the several systems are either recorded separately, and later placed adjacent to each other for the operator to interpret, or they are relayed to a central station and simultaneously recorded on the same strip of paper.

When the messages from the plurality of systems have been recorded it will be found in nearly all cases that the static obliterating a portion of a message received at one station is entirely absent in the message received at one or more of the others or else is of such character or magnitude that this portion of the message can be distinctly read.

Signaling with High-Frequency Waves

No. 1,449,382: Patented March 27, 1923. Patentee: John R. Carson, New York, N. Y.

THIS invention relates to a signaling system wherein signals are transmitted by means of a modulated high frequency carrier wave, and more particularly it relates to a wireless telephone system. Its objects are: (1) to provide a transmitting system whose characteristic is such that the transmission or radiation of energy is automatically prevented except during the time when signals are actually being transmitted and the transmission or radiation of the unmodulated carrier wave is at all times prevented; (2) to provide novel tuning adjustments at both receiving and transmitting



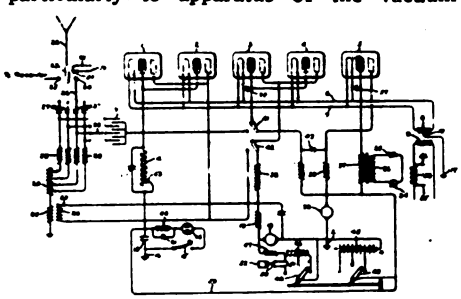
Employing vacuum tubes to modulate the high frequency produced by other vacuum tubes so as to obtain perfect modulation and transmission.

stations; (3) to provide means at the receiving station whereby both the quality and intensity of the received speech is improved as well as the selectivity of the receiving system; (4) to provide arrangements for the duplex transmission of signals; and (5) to provide a duplex translating arrangement comprising individual paths and a common path so associated with an outgoing circuit and two incoming circuits comprising sources of electrical variations, that said outgoing and incoming circuits will be independent of each other, and oscillations from one of said sources will only be transmitted through the translating arrangement to the outgoing circuit when the other source is active.

High-Frequency Signaling System

No. 1,449,722: Patented March 27, 1923. Patentee: Walter R. G. Baker, Schenectady, N. Y.

MY present invention relates to high frequency signaling systems and more particularly to apparatus of the vacuum



Method enabling the duplex transmission of signals with extreme clarity at the receiving end.

tube type for producing and modulating high frequency oscillations for use in a signaling system.

One of the objects of my invention is to provide a system which will be capable of generating high frequency oscillations and supply them to a transmitting circuit. These may be in the form of speech modulated high frequency waves such as are used for radio telephony, interrupted continuous waves for radio telegraphy or continuous waves for radio telegraphy. Still another object of my invention is to provide a system in which vacuum tubes are employed for modulating high frequency waves.

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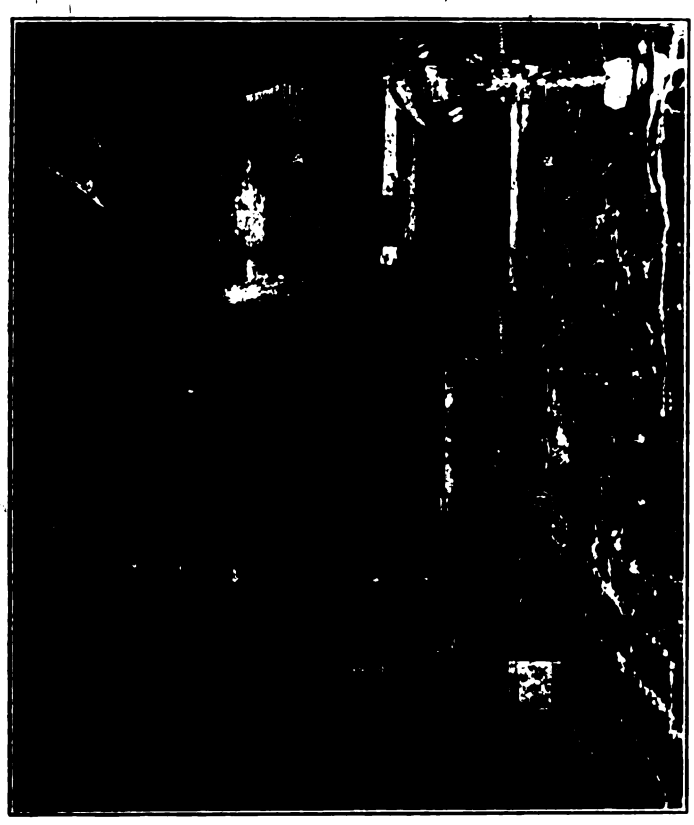

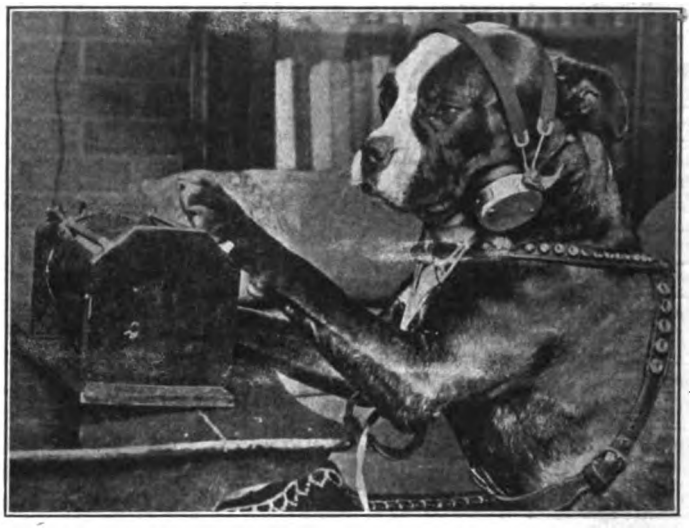

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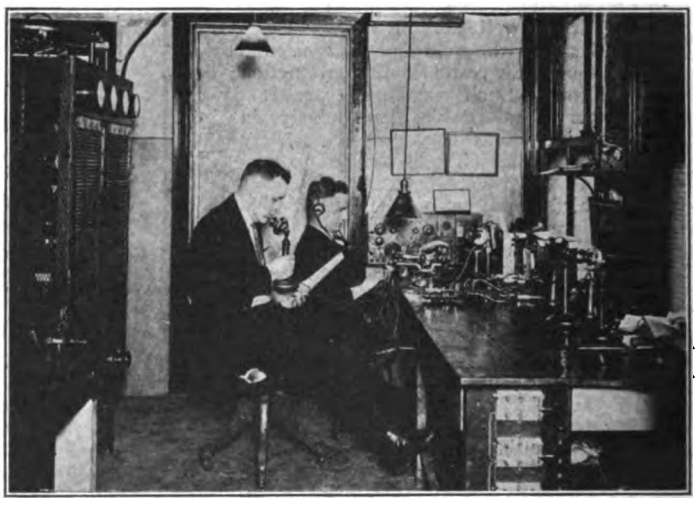
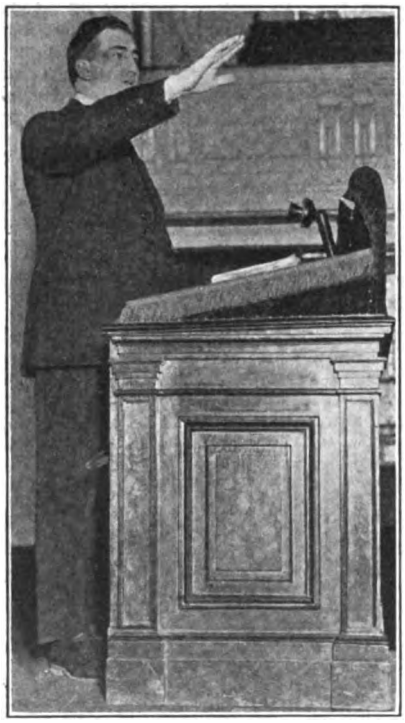


(C. Photonews, N. Y.)

The above illustration shows the interior of the operating room of Station KYW, the Westinghouse Radio Station in Chicago. The transmitting apparatus is contained in the steel cabinet shown at the left of the photo.



(C. Kadel and Herbert)

The fact that radio has already taken a great place in religious work was again demonstrated when the City Temple, Lenox Ave. and 120th St., New York City, installed a powerful broadcasting set and station to allow many thousands of radio listeners to be within reach of church, even though they stayed home on Sunday mornings. The larger illustration at the top of this column shows the apparatus that has been installed to take care of the direct broadcast. R. Ketcham, who installed the set, is shown operating it on its final test before being put into actual operation. The wave meter, shown on the table, is a part of the equipment and readings are taken before every broadcast to assure the operators of WSAP that they are within the 360-meter wave. The apparatus is up to date in every manner, a standby listening-in system being used to enable the operator of the station to tell just how the music is going out and to correct any fault. The lower picture shows the way in which the microphone has been installed on the pulpit, shielded from the eyes of the congregation.

Station of Marius Thouvais, president of the Radio Club de Sologne, France, whose set was described in a recent issue of RADIO WORLD.

(C. Amrad Photo)

Captain Donald K. MacMillan, Arctic explorer, relating over the radio of the Amrad Station, at Medford Hillside, Mass., his experiences in his travels through the frozen northland.

(C. Kadel and Herbert)

The Rev. Lyman R. Hartley, terian Church, New York C the homes of sick members of church" regularly. Mr. Hart congregation in the operatio

A GLIMPSE OF THE WORLD READERS

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...est "Skeet-...radio dog, ... Mrs. C. D. ... of Minne-...apolis" ob-...serving the ... his ears, ...hang them ... head. He ...usic, but ...anybody at-...vocal solo. ...human!

(C. P. and A. Photos)
Little Winifred Coker and her mother. Miss Coker holds the distinction of being the first "radio christened baby" on record. The ceremonies took place at WSB, Atlanta, Ga.

(C. Kadel and Herbert)
The Salvation Army has adopted radio in its routine work as a means of teaching small boys and girls that they meet in their ministrations the benefits of radio. Brigadier W. Palmer, of the Salvation Army, is shown giving instruction in the operation and care of regenerative sets. These girls are being trained as thoroughly as the regular army operators.

(C. Keystone Views)
Radio receiving sets have been installed on the Pullman cars running between London and Dover to keep travelers entertained and comfortable. Sir Davison Dalziel, chairman of the Pullman Car Company, is being entertained while waiting for the Garcon to bring on his "paté de foie gras." Six tubes and a powerful amplifier are used because of the low short antenna that is of necessity used.

...liams Service)
...f Earthalmess finds that radio helps him ...on time, by keeping his watch right to ...ond. The moving picture colony have ...ally adopted radio as one means of ...g the idle minutes that occasionally happen in their busy days.

"Radio Pastor" of Fort George Presby-...ecently helped install receiving sets in ...congregation, so that they could "attend ...pictured instructing a member of his ... a tube set donated for the purpose.

(C. Underwood and Underwood)
What constitute the rights of the air will be determined in a few days, when the first injunction suit ever instituted on the question will be tried at Levingston, Ill. E. McWilliams, a wealthy banker of Dwight, is suing Wylie Bergman, an amateur, claiming that his transmitter interfered with the former's receiving equipment to such an extent that it was impossible to listen in. Mr. Bergman's antenna and station are here shown. The money for mast and apparatus was obtained by doing odd jobs. The notables of the radio world are watching this case with intense interest.

Relative Capabilities of Double-Circuit and Single-Circuit Receivers

By E. E. Bucher

MISINFORMATION has been broadcast to the radio trade with regard to relative capabilities of the double-circuit and single-circuit receiver. By skilful distortion of certain fundamental technical facts, the public, as well as the jobber and dealer, have been informed and in some cases led to believe that the two-circuit tuner enables one to obtain unusual results which cannot possibly be secured with the single-circuit tuner.

There are, however, certain outstanding facts in the situation which no amount of propaganda can contravene:

First—The interference sometimes encountered in radio broadcasting reception is primarily a problem of broadcasting transmission. It can be fully eliminated only by the enactment of suitable government legislation that will enable wave lengths other than 360 and 400 meters to be assigned to broadcasting stations.

Second—No receiving tuner, whether it be of the single or double-circuit type, will prevent two broadcasting transmitting stations operating identically on the same wave length from setting up interference in the receiving set, unless the signals of one station are of sufficient intensity to drown out those of the other station.

Third—Two broadcasting stations operating on nearly the same wave lengths will produce an audible note or "whistle" in a receiving apparatus, which no tuner of either the single or double-circuit type will eliminate. The cure for this problem is the assignment of wave lengths to the transmitting stations of sufficient separation so as not to produce an audible note.

The single-circuit tuner will enable the listener to differentiate between two local broadcasting stations by one of two ways, (a) by connecting a .001 mfd. fixed condenser across the antenna and ground binding posts, or (b) by erecting a short antenna 15 to 40 feet in length and not of too great height. It has been conclusively demonstrated that a low antenna gives greater selectivity than a high antenna.

Selectivity in regenerative receiving sets is primarily dependent on the amount of regeneration. Two local broadcasting stations on different wave lengths will often interfere with one another on either the single or double-circuit receiver, but this is due to the overwhelming power of the transmitter which causes the apparatus to respond even when not accurately tuned to the transmitter. It has been demonstrated beyond all cavil that interference set up by two local stations can be eliminated on the single-circuit receiver by an antenna not exceeding 40 feet in length.

The ordinary regenerative set with the double-circuit tuner gives from 20 to 50 per cent less signal than the single-circuit with the same number of tubes and the same general circuit. In other words, stronger signals will be obtained, in long distance reception, from a single-circuit set than from a double-circuit set.

For those who have interest in long distance reception, as well as local reception, it is sometimes advisable to erect two single wire aerials, one for long distance reception—which may be of any length up to 150 feet, and the other for local reception—which may be of any length up to 40 feet, depending upon the sensitiveness of the receiving instrument. The small antenna enables one to differentiate between local signals, while the large antenna can be used for long distance work after the local stations have discontinued.

Many users of broadcasting sets are now installing two antennae—a long one for long distance reception after the local stations have closed down, and a small one, or an indoor aerial, for local reception. The indoor aerial may consist of 25 to 50 feet of lamp cord concealed behind the picture moulding, or a piece of inconspicuous No. 28 wire stretched across the corners of the room. Listeners located up to 15 or 20 miles from a broadcasting station can often obtain all the signal audibility necessary for local work by concealing the antenna under the carpet of the living room or the library of the home.

The foregoing are technical points which will stand the closest analysis. Speaking purely from the practical phases of the matter, the single-circuit tuner is, without qualification, the most suitable for the novice, that is, for the user unskilled in the art; for generally, the multiplicity of knobs involved in the operation of the double-circuit tuner places them beyond the stage of practicability for the non-technical public. Single-circuit tuners were designed primarily with the idea of providing simplified operation, and as such, they enable the novice to obtain results which can only be secured from the double-circuit tuner when the user possesses an intimate knowledge of the technicalities of the art.

Comparing collectively the advantages of the two types of tuners, it is clear that the single-circuit tuner is by far the more useful to the average member of the family, as it enables picking up far distant or local broadcasting stations with a minimum number of adjustments. Usually the distant station can be found on the single-circuit tuner several minutes before it can be located on a double-circuit tuner, to say nothing of the increased strength of signal which the single-circuit set provides.

For long distance reception, it is preferable in every case to install an outdoor antenna in a free open space keeping the lead-in away from the building and bringing it as directly to the receiving apparatus as possible. The antenna is preferably kept at the maximum distance from the trolley car lines, power lines, trees, buildings, etc., whereupon a marked increase in selectivity and in signal strength will be obtained. Lead-in wires should not be tacked to wooden mouldings or laid parallel to metal mouldings.

Heard Over the Radio Counter

EPISODE XV.

"'Lo, Bill! How are you?"

"Well, holy oscillators and jumping regeneration, Jack, where did you fall from?"

"Oh, just got back from the zone. Guess I'm here permanently now. What's new?"

"Oh, say, you don't know anything. Everything is changed since you went away. Why, even crystal detectors are coming back. What do you think of that?"

"Ahah, quit your kiddin'. I read the papers. Some bunch got across during the tests, didn't they?"

"You said it. Say, what are you goin' to do—set up another station, or stay away from it altogether?"

"Stay away! I should say not. I'm going to rig up a set that's going to be the crocodile's cough. Say, what kind of a tube is that over there? No, not that one; the one next to it."

"Oh, that's a new tube the G———— Electric just brought out. It's a pip, kid; you can't beat the tubes they are turning out now-a-days."

"Go on. I'll bet a stack of wheats in Childs' against a diamond tiara that they aren't as good as the old tubular audions that they used to turn out."

"O. K., OM; you're on. Come over here and listen to this tube work in any set in the house. Take your pick."

"Well, let's try it on that two-step regenerative over there."

"Well, there is Atlanta, Georgia. Is that plain enough?"

"Sure! Let me work that set for myself. It's been so long since I worked a regular set that I don't know how to turn the dials any more. Say—SSSHHH! It's a 6—O, boy! Gimme two of these tubes quick before I change my mind and buy a dozen."

"O. K., OM. Come on up to the house tonight and listen to some real DX on a three-step radio frequency with just a loop. I get them all."

"Sure! Say, rustle up that change, will you? I want to get home. I think the bug bit me all over again."

Coming! New List of Broadcasters!

While the Department of Commerce has assigned wave lengths for each of the broadcasting zones established by the recent Second National Radio Conference, individual assignments of station wave lengths have not been announced. They are being arranged as rapidly as possible and as soon as finished A COMPLETE, UP-TO-DATE LIST OF BROADCASTERS will be published by RADIO WORLD.

The allocation of wave lengths for Class B stations appears elsewhere in this issue of RADIO WORLD.

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"Killing Two Birds With One Stone"

TWO merchandise radio goods successfully the manufacturer needs, first, to sell the trade and then the consumer—two birds that need a killing.

The trade hesitates about stocking goods until there is a consumer demand, and the consumer cannot buy until the dealer is stocked, for the average man is not a mail-order buyer; so this is the stone radio manufacturers stumble over.

RADIO WORLD is a "fan" weekly. Seventy odd thousand read it weekly to learn what kind of a radio receiving set to buy or how to improve, add to, or make work better the radio equipment they now have.

Each Thursday RADIO WORLD goes to press with every bit of radio news and information that breaks up to midnight, and, wherever you live, your nearest newsstand has RADIO WORLD the following Wednesday morning, while the monthly radio publications trail along with the news six to eight weeks after.

A radio dealer or jobber must be as well informed as his buyers (the consumers). When asked about the Armstrong, Flewelling, Reinartz, or Hazeltine circuits Mr. Dealer cannot very well say to Mr. Consumer: "In six or eight weeks I'll get the information from some radio monthly and then I'll be able to wait on you intelligently."

No, Mr. Dealer does not say this. He sends in his six-dollar subscription. *He reads* RADIO WORLD *each week as a matter of business necessity.* Unquestionably more radio dealers and jobbers read RADIO WORLD than any radio trade monthly.

Here, then, is how two birds can be killed with one stone—i. e., by advertising in RADIO WORLD 70,000 live radio buyers (consumers) are reached, and, simultaneously, almost one hundred per cent of all the radio dealers and jobbers read your advertisement.

RADIO WORLD is the weekly radio publication that creates demand, reaches the buyers, and sells both the consumer and the dealer with the one advertisement.

Circulation is less important in RADIO than READER INTEREST. For instance, the same keyed advertisement was run in RADIO WORLD and in another publication of over a million guaranteed circulation. RADIO WORLD brought cash returns of over two to one. Why? The million copy publication was bought because it contained good literature—RADIO WORLD because it supplies the radio information desired. This is one reason why thousands choose to pay three times as much per copy for RADIO WORLD as for the *Saturday Evening Post.*

Now the Theatrical Managers Want Broadcasting Royalties

THE Producing Managers' Association of New York City does not intend that royalties for broadcasting shall flow only to the American Society of Composers, Authors and Publishers.

On behalf of the producing managers, Arthur Hammerstein issued last week an announcement that no music from any opera, musical comedy or musical play would be permitted without the consent of the producing managers.

The musical plays now being produced, as well as other plays, are the property of the producers, Hammerstein contends. Any play, once delivered over to its producer, cannot again be bartered by the author or composer, or by any organization of authors and composers.

Broadcasters, the royalty line forms on this side!

"Synthetic Resins and Their Plastics," by Ellis

SYNTHETIC RESINS AND THEIR PLASTICS," by Carleton Ellis, consulting chemist, has been received from the Chemical Catalog Company, Inc., of New York. It is a highly technical, historical and comprehensive dissertation on the chemistry, compounding and uses of synthetic products of a resinous character. Some of these, such as bakelite, are used in radio work for insulating purposes. The price of the book is $6.

Radio Market Possibilities Abroad

MR. JULIUS KLEIN, director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, recently stated that conditions affecting the market possibilities for radiotelephone apparatus are changing rapidly throughout the world. Interest appears to be universal, and no branch of the electrical industry in recent years has been given such popular publicity as has radiotelephony. Broadcasting service is gradually being introduced in all the important countries, with a resultant brisk demand for receiving sets. Even people in isolated and remote regions, cut off from quick contact with the rest of the world, and fascinated by the possibilities opened up by radiotelephony, are installing expensive tube sets to enable them to hear distant broadcasting stations.

WEAF Capitulates on Broadcasting Royalties

THE dispute between the American Society of Composers, Authors and Publishers and broadcasting stations in and near New York over the question of copyright took a new turn last week, when Station WEAF, controlled by the American Telephone & Telegraph Company, and operated by the Western Electric Company, took out a license from the society. A contract was signed calling for an annual payment, which gives WEAF the right to broadcast any compositions the copyright of which is vested in the society.

No Wireless Receiving Set is complete without

The MAGNAVOX Radio

"The Reproducer Supreme"

MAGNAVOX products are designed in our own laboratories and manufactured in our own factory—greatly extended in size during the past few months.

The Magnavox Power Amplifier has been designed for use especially in connection with the Magnavox Radio, and its use greatly increases your range and signal strength.

Every owner of a Magnavox Radio should also add the Power Amplifier Model C if he has not already done so.

R-2
Magnavox Radio
with 18-inch Horn

FOR those who wish the utmost in amplifying power; for large audiences, dance halls, etc. Requires only .6 of an ampere for the field.

Price, $60.00

Type R-3
Magnavox Radio
with 14-inch Horn

THE same in principle and construction throughout as Type R-2, and is ideal for use in homes, offices, amateur stations, etc.

Price, $35.00

Magnavox
Power Amplifier
Model C

INSURES getting the largest possible power input for the Magnavox Radio. Can be used with any "B" battery voltage which the power tube may require for best amplification.

AC-2-C, 2-Stage $55.00
AC-3-C, 3-Stage $75.00

Magnavox Products may be had of good dealers everywhere.

The Magnavox Company
Oakland, California
New York Office: **370 Seventh Ave.**

Radio brings it MAGNAVOX tells it

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Some DX Records to Shoot At

Tennessee, the Land of Songs

From Frank D. Sutton, Sparta, Tenn.

AM sending my "record" for publication in your DX Nite Owl Dept. It is a one tube set using the diagram published on the cover of Radio World, dated September 16, 1922. It is one using a variable condenser.

The following are stations, twenty in number, received in two hours and thirty minutes, which came in as loud as my two step regenerative: WGM, WSB, WBT, WBAP, WHAS, KDKA, WWJ, WMC, WDAJ, WOAN, WCX, WFAA, WJAS, WJAR, WCAZ, WDAF, WLK, WJAX, WHB, WSW. The nearest is 75 miles and the furthest, 750 miles.

Just Like the Lizzie, It Gets There Just the Same

From W. A. Cale, 296 Madison St., Brooklyn, N. Y.

This is a list of stations I have heard on one tube while DXing for less then a half hour on four different evenings. Several of them I heard on each of four evenings. Chicago and Kansas City come in particularly well, and are as clear as nearby stations.

WBS, WJZ, WOR, WAAM, WEAF, WHN, WOC, WDAP, WGM, WDAF, 2BR, KSD, WOS, WLAG, WMC, WIP, KDKA, WGY, WNAC, WGI, WLAK, WBAN, WBS, WHAS, WHAZ, 2XB.

The set costs about six dollars plus batteries, tube and phones. These latter items vary greatly with the type used. The set cost $14.45 complete. I shall be glad to answer any inquiries made by your readers.

Only Slightly Damp Around the Ankles

From A Constant Reader, 2316 Each Michigan Ave., Lansing, Mich.

JUST want to say that Mr. Keating's record for DX is the best ever, though I have copied some long-distance stations myself with humble galena, though not equalling his record by any means. My outfit consisted of 2-slide tuner, fixed condenser, ten-cent store detector and phones. Antenna 230 ft. long, 40 ft. high at farther end with 20 ft. lead in at lower end. With this outfit I have copied KDKA, WJZ, WOR, WHAZ, WOC, WCAE, WCX, WWJ, WDAP, WGY, WHB, and any number of code stations.

A "Nite Hawk" to the "Nite Owls"

From "Nite Hawk" Wm. L. Klein, Box 950, Newark, Ohio

I HAVE been a constant reader of your valuable magazine for about six months now and can truthfully say there is none better. Always up to the minute with new dope and circuits. Below you will find a "Nite Owl" record which I think will compare favorably with any I have seen so far. I have listened to stations in 25 states, Canada and Cuba. Following are some of the stations: CFCA, CFCN, KFI, KHJ, KFFQ, KSD, KYW, PWX, WBAP, WBAV, WBZ, WEAF, WGI, WGM, WGY, WHA, WHAS, WJZ, WLAG, WLAK, WLK, WMC, WOC, WPAC, WSB, WSY, WOAW, and many others I didn't enumerate. I am using a standard three-circuit set with two stages of audio-frequency amplification composed of the following parts: One general radio .001 primary condenser, one Kellogg variocoupler, secondary condenser, and variometer, Rhamstine and all American transformers, rheostats. I am using a detector tube called the "Vacobob" and WD-11's for my amplifier. This is a home-made set and I would like to see anybody better this record.

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

High and Handsome from St. Louis

From Lawrence Levy, 5915 Lindell Blvd., St. Louis, Mo.

HERE is my record, using two sets. My aerial is two wires 80 feet long and 40 feet high. The ground is a wire attached to a pipe driven into the ground. One set is a single circuit tuner with two stages of audio-frequency amplification. The other, which I have just finished, is a one-tube set using the Flewelling super circuit. This has worked fine on either aerial or ground, as both cannot be used at the one time. I have received Schenectady, N. Y., on ground alone. I recommend this set to any one wanting a cheap long distance receiving set.

List of stations received: CFCA, CFCN, CJCG, KDKA, KFI, KFAF, KHJ, KOP, KWH, PWX, WBL, WBT, WCX, WGF, WGM, WGR, WGY, WHA, WHB, WJZ, WLK, WLW, WMC, WOC, WOH, WOI, WOQ, WOR, WOS, WPA, WSB, WSY, WWJ, WAAC, WAAL, WAAP, WAAZ, WBAP, WBAV, WCAE, WCAL, WCAW, WDAF, WDAJ, WDAP, WDAO, WDAV, WFAA, WGAS, WHAS, WIAA, WIAO, WJAN, WJAP, WJAX, WLAG, WLAL, WMAQ, WNAD, WNAV, WOAI, WOAN, WOAW.

A Thousand Miles on a One Foot Square Loop!

From George Bailey, Weston, Mass.

I WISH to thank you for the article on Reflex Hook-Ups by W. E. Thompson, in your March 3 issue. I have obtained really wonderful results, and wonder if readers realize what can be done with the hook-ups. I picked out the three tube set with the crystal detector, and put it together, following directions very carefully. For the plate resistances I used a variable grid leak, values 1,000 to 100,000 ohms, on the middle tube, and on the other tube a carbon potentiometer, values 0 to 5,000. Both of these instruments I had on hand, and found that they worked well. For tubes I used three U. V. 201, with 90 volts on the plates for volume, but 45 will work.

I made a loop just twelve inches square, with nineteen turns of ordinary insulated bell wire, and I put this in the circuit.

And now here comes the fun. I turned on the juice, set the condenser for resonance, turned the vernier on it, caught a carrier wave, then a girl singing came in loud. Weston is twelve miles from Boston, and as it was late for the local stations I thought I had New York, but to my surprise it was WDAP, the DRAKE HOTEL, CHICAGO! I hung the phones on the hook, got out my tape measure, and backed off twenty-five feet from the phones, and the music was plainly audible.

A little later I picked up WOC, DAVENPORT, IOWA, very loud and clear. Then WSB, ATLANTA GEORGIA! ! !

The set is surprisingly selective, as a swing of the loop cuts out WNAC completely, only twelve miles away, and a slight turn of the vernier brings in a distant station.

The two local stations, WNAC and WGI come in very loud on a Victrola with a tone arm attachment, and the modulation is almost perfect, as the crystal detector is much better than a tube for a detector in the case of clearness, and only a little less in volume.

To obtain good results, the plate reistances must be always used in tuning. The potentiometer must be set very carefully also. The loop condenser needs a vernier, and with care very sharp tuning is obtained. The rheostat on the third tube can be used for final adjustment, but is not important.

I have only been a "radio bug" for a year, but I have tried many hook-ups, and this one is best of all. I enjoy your weekly very much, and hope you will "Live long and prosper."

All on One Tube—Whee!!

From Henry A. Westermeyer, Cleveland, Wis.

RECEIVED my first copy of RADIO WORLD last week, and it sure is a fine radio magazine.

Herewith I send you a list of 34 broadcasting stations which I received February 15, 1923, from 6 p. m. to 12 p. m. on a single-tube set, no amplification, WKAQ, of San Juan, Porto Rico, and KFI and KHJ, of Los Angeles, Cal., being the most distant stations heard.

The mileage of the 34 stations is a total of 22,085 miles, which I think is very good for a one-tube set. My set is a "Michigan Junior," made at Grand Rapids, Mich.; and my antenna is 125 feet long, 35 feet high.

Call Letters	Location	Distance
WKAQ	San Juan, Porto Rico	2,240
WGY	Schenectady, N. Y.	695
WMV	Washington, D. C.	645
WMAQ	Chicago, Ill.	150
WMAV	Auburn, Ala.	795
KDKA	East Pittsburgh, Pa.	450
WPA	Fort Worth, Texas	950
WCX	Detroit, Mich.	265
WIAO	Milwaukee, Wis.	60
WLAL	Tulsa, Okla.	710
WGM	Atlanta, Ga.	750
WOC	Davenport, Ia.	230
WWJ	Detroit, Mich.	265
WHB	Kansas City, Mo.	495
WMC	Memphis, Tenn.	625
WEAF	New York, N. Y.	725
KYW	Chicago, Ill.	150
CFCA	Toronto, Ont.	420
WEAN	Providence, R. I.	815
WKAC	Lincoln, Neb.	530
KLZ	Denver, Col.	960
WFAA	Dallas, Texas	940
WFI	Los Angeles, Cal.	1,770
WOI	Ames, Ia.	335
WCAE	Pittsburgh, Pa.	450
WBAP	Fort Worth, Texas	950
WSB	Atlanta, Ga.	750
KHJ	Los Angeles, Cal.	1,770
WLW	Cincinnati, O.	360
WLAG	Minneapolis, Minn.	300
WDAP	Chicago, Ill.	150
WCAL	Northfield, Minn.	260
WDAF	Kansas City, Mo.	495
CKCG	Winnipeg, Manitoba, Can.	630
	Total	22,085

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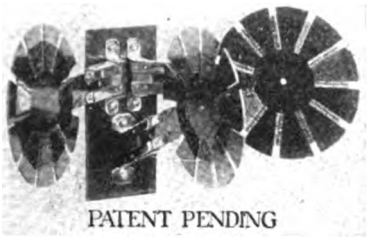
THE GOODMAN



PATENT PENDING

The Niftiest Short Wave Tuner on the Market Only $6.00 & PP on 1 lb. Send for pamphlet.
L. W. GOODMAN
DREXEL HILL, PA.
The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

"The Little Wonder"
FOR BOYS AND GIRLS
CRYSTAL SETS
Unassembled-Net **$3.50**
Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at $5.00.
GUARANTEED TESTED CRYSTALS
Galena 15c Radiosite 20c
Write for Free Catalog
It lists all our radio parts and supplies.
Holloway Elec. Supply Co., Inc.
238 Third Ave. New York City

WBZ Broadcasts Concert in French

GREAT interest was aroused in and around Springfield, Mass., last week, when a group of ten famous French artists visited the city to give a concert from radio station WBZ of the Westinghouse Electric & Manufacturing Company. These artists were sent by "La Presse," of Montreal, Canada, and their appearance was one of the big events in the musical season at Springfield.

This concert would seem to indicate a new era in radio broadcasting—this is, a traveling company from one station to another. It is possible that the exchange of artists by the large radio stations may be one of the future developments in this great art. Naturally any city, outside New York and Chicago, will utilize all available talent in a year or two and the same artists must perform over and over again. By the exchange of talent each city can gain a variety.

The artists were in charge of J. N. Cartier, the famous announcer from station CKAC of the Montreal "La Presse." He made the announcements both in French and in English. Mr. Cartier speaks both languages fluently and his speaking first in one language and then in another was a novelty in broadcasting.

WBZ was fortunate in securing Mr. Cartier to make the trip to Springfield, as he is considered one of the best of radio announcers. Besides being an excellent announcer, Mr. Cartier has had much experience as a newspaper man, soldier and wireless operator. He is a direct descendent of Jacques Cartrier, one of the earliest pioneers of Canada, and possesses the roving spirit of this forbear. He was a wireless operator before he was twenty years old and has had many experiences in the frozen North.

Radio Controlled Airplane

A THREE HUNDRED horse-power Voisin bombing airplane, carrying two passengers, made a flight last week, all movements of which were controlled by radio from the ground. The demonstration was made at the flying field at Etampes, France, and was directed by Captain Boucher, of the French air service, from a hangar, in which was located the switchboard for controlling the airplane's movements. The landing was made without difficulty.

W. T. 501 DETECTOR TUBE
For tube sets, or to convert crystal sets into tube sets at small cost. **$2.00**
Special Socket 40c extra
Special Adaptor 75c extra
RADIO RESEARCH GUILD
40 Clinton St. Newark, N. J.

RADIO TUBES REPAIRED
"Guaranteed Equal to New"
FOUR DAY SERVICE
6 V. Detectors, $2.50; Amplifiers, $2.75;
5 Watt Power Tubes, $4.00
Refilled Tubes Always in Stock
Our repaired tubes speak for themselves.
Radio Tube Laboratories, Inc.
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(Patent Pending)
A Synthetic CRYSTAL DETECTOR sensitive over its entire surface
Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.
Price, mounted, Sensitiveness guaranteed **50c**
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14-Karat Gold Multiple contact. Supersensitive **25c**
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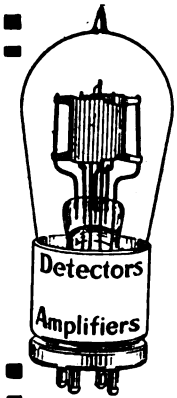


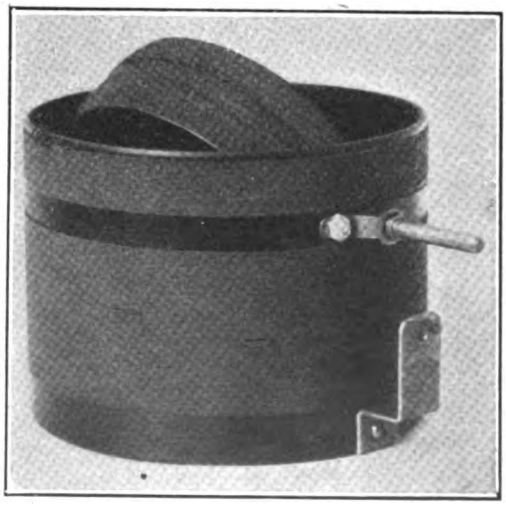
GUARANTEED REPAIRS
Broken and Burned Out
VACUUM TUBES
W.D.-11 not accepted for repair
Your dealer should know, but if he does not, send direct to
HARVARD RADIO LABORATORIES
Boston 9, Mass.
Tubes returned parcel post C. O. D.

TO GET THAT DISTANT STATION
USE A COAST COUPLER

This coupler is designed along strictly scientific lines, and is the result of eighteen months' experiment. Wound with green silk covered wire on Bakelite tubing. Very selective.

Following are a few of the many DX stations received with this coupler, and detector tube only, at Long Beach, California:

PWX, Havana, Cuba
WWJ, Detroit, Mich.
WSB, Atlanta, Ga.
WDAP, Chicago, Ill.
CFCN, Calgary, Can.
WBAP, Ft. Worth, Texas



Our adaptation of a popular hook-up furnished with coupler. Coupler fully guaranteed when hooked up according to instructions.

Coupler and diagram, sold only under our money back guarantee. Mailed anywhere in the United States upon receipt of $5.00. Post Office or Express money order.

Make All Remittances Payable to
COAST COUPLER COMPANY
321 WEST SEVENTH ST. LONG BEACH, CALIFORNIA

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Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Frank O'B. Nehin, 39 Fairchild Place, Buffalo, N. Y.
H. C. Bachle, P. O. Box 774, Hartford, Conn. (Retailer.)
Vincent French, 31 Kingsville Avenue, Ashtabula, Ohio.
Earl Horstmann, 159 Kearney Street, Kearney, N. J.
The Wilkenda Company, Walden, N. Y. (Distributors.)
Flynn Bros., Box 702, Cement, Okla. (Interested especially in radio parts.)
Clark O. Darling, Sidney, N. Y. (Dealer.)
Alexander Electrical Company, Hollis, Okla. (Dealer.)
The Berger Drug Co., 1024 South Washington St., Marion, Indiana. (Retailers.)
H. Spencer Graham, 2621 Verdun avenue, Los Angeles, Calif.
Edwin Webster, 1903 Moser Avenue, Dallas, Texas.
R. E. Head, 67 J Street, Salt Lake City, Utah.
P. Ricard West, 18th floor, Keith Theatre bldg., Philadelphia, Pa.
R. Watt, 359 Forty-third Street, Brooklyn, N. Y. (Retailer.)
The A. N. Whitlock Co., 501 Eighth Street, S. W., Washington, D. C.
M. E. Chapman, Logan, Kansas.
Robert O. Cull, Box 354, Frederick, Oklahoma.
Alf. Giroux, 426 Centre, Pte. St. Charles, Montreal, Canada.
H. P. Johnson, 706 Fort Street, Victoria, B. C., Canada.
Bartell J. Geib, Box 73, Shreve, Ohio. (Retailer. Wants an agency.)
Roy M. Canfield, 45 N. Park Street, East Orange, N. J.
Joseph N. White, 2731 W. Silver Street, Philadelphia, Pa.
Lemuel D. Leighton, 33 Elm Street, Waterville, Maine.
Max R. Hoffman, 20 Rowsley Street, Apt. 3, Bridgeport, Conn.
O. Kein, general manager, United Music Stores, 619 Cherry Street, Philadelphia, Pa.
Henry N. Omitt, Box 58, Iola, Wisconsin.
George McGuire, 126 West Fifth Street, Erie, Pa. (Wants to purchase good set.)
Edgar L. Pond, 11 Boyden Street, Worcester, Mass. (Will buy or build a set.)
H. K. Witherspoon, Box 17, Raleigh, N. C.
G. C. Mullikin, 1323 Fifth Street, Ft. Madison, Iowa.
G. B. Fleming, 75 Adelaide Street, St. John, N. B., Canada.
Henry Hall, 213 North Rose Street, Baltimore, Md.
James D. Savage, 5809 Rodman Street, Philadelphia, Pa.
A. L. Ober, Box 466, North Manchester, Ind.
Hayden Deaner, 211 Church Street, Danville, Pa. (Retailer and distributor prices wanted.)
B. E. Brown, Lincoln, Maine.
Harry W. Six, 71 Church Street, New Rochelle, N. Y.
D. J. Shinn, Box 172, Elgin, Kansas.
James N. Crowder, Box 599, Memphis, Tenn.

Combined Condenser-Grid Leak

A NEW product of the Charles Freshman Company, New York City, and one which will prove a very popular addition to their ever-increasing family, is a combined condenser and grid leak made for panel mounting. With this new product it is not necessary to muss around the inside of a set, when it is necessary to change the capacity of the leak, but by having it handy on the outside, the change can be quickly made. In construction it much resembles the old and well known product but, being square, looks very well on any panel. Two machine screws with nuts and washers project through to the back making it necessary to drill only two small holes

New Radio and Electric Firms

Wireless Ignition Company, apparatus, $50,000; C. Willis, J. H. Strong, W. H. Koch, Minneapolis, Minn. (Delaware Registration Trust Co.)

Joplin Electric Steel Company, electric steel and iron castings, $20,000; J. A. Lininger, New Wilmington, Pa.; J. M. Lininger, Sharon, Pa.; George R. Chapman, Erie, Pa. (Arley B. Magee, Dover, Del.)

Electric Power Securities Company of Niagara Falls, Buffalo, N. Y.

Krasco Mfg. Co., Illinois, make phonograph motors, 1,000 shares preferred stock, $100 each; 1,000 common, no par value; representative, D. S. Root, 120 West 42d St., New York City.

Commonwealth Electric Co., appliances, $135,000; James M. Whalen, Paul S. Schorr, Arthur L. Abbott, St. Paul, Minn. (Arley MaGee, Dover, Del.)

American Radio & Electric Corp., Wilmington, Del., apparatus, $3,000,000. (Registrar & Transfer Co.)

Radio Panel and Parts Corp., New York City, $15,000; S. J. Spector, A. G. Heller, W. A. Southworth. (Attorney, I. F. Vogel, 233 Broadway.)

Amsco Products, New York City, wireless apparatus, $100,000; C. Hardy, B. H. and C. H. Price. (Attorneys, Price Bros., 261 Broadway.)

Radio Box Co., Brooklyn, N. Y., $10,000; B. and E. Lubatkin, I. M. Torodosh. (Attorney, C. Goldenberg, 261 Broadway.)

Lane Relay Company, Waverly, N. Y., signal systems, $500,000; W. H. Lane, C. R. Williams, J. J. Higgins. (Attorney, E. W. Eaton, Waverly.)

Elgin Electric Corp., New York City, incorporated for $15,000. Directors, L. Weisberg, E. Gettinger. (Attorney, S. B. Lillienstein, 280 Broadway, New York City.)

Radio Stocks

(Quotations as of April 18, 1923, Furnished by Frank T. Stanton & Co., 35 Broad Street, New York, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi Stamped..	5*	15*
American Marconi Unstamped	$5	$7.50
American Tel. & Tel.....	122¾	123
Canadian Marconi.....	2¼	3¼
Dubelier Condenser.....	13½	14
English Marconi com.....	10	15
English Marconi pfd.....	10½	15½
Federal Tel. Calif.....	5	5½
General Electric.....	180	181
Henessey Prod. Corp. 8% pfd.	9	11
Mackay Companies com.....	113	116
Manhattan Elec. Supply.....	55	58
Marconi Int. Marine.....	7	9½
Radio Corporation com.....	3⅞	4
Radio Corporation pfd.....	3⅝	3¾
Spanish Marconi.....	1	3
Western Union.....	113	113½
Westinghouse E. & M.....	57	57¾

*Cents

Coming Events

PERMANENT RADIO FAIR FOR BUYERS. Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

RADIO EXHIBITORS OF BROOKLYN, general exposition of radio apparatus and accessories. Signal Corps Armory, Dean Street and Washington Avenue, Brooklyn,

Advantages of the Hazeltine Neutrodyne Circuit

PROFESSOR L. A. HAZELTINE in commenting recently upon his new receiver, now widely known as the "Hazeltine neutrodyne receiver," said in part: "The neutrodyne circuit is in effect a desirable simplification of all previous circuits and not, as many people think, an elaboration. In eliminating certain disturbing features that now exist in present sets, I, of course, had to change the design of several of the parts that are thought to be standard; but in doing so, I eliminated all previously existing disturbing features so that perfect relay amplification was possible. This circuit will get the utmost out of a received signal that can be had, without any extraneous noises, and with the least possible amount of tuning controls."

Where Push and Pull Transformers May Be Obtained

The article on a power amplifier by C. White, published in RADIO WORLD for February 24, 1923, apparently has created great interest among amateur builders. Numerous letters have been received by the author and RADIO WORLD inquiring where the push and pull transformers mentioned in the article can be obtained. In reply to these inquiries RADIO WORLD is requested by Mr. White to state that they may be secured from the General Radio Company, Cambridge, Mass. Letters addressed to Mr. A. F. Murray, in care of the Engineering Department of this company, will receive his personal attention and prompt action.

Injunction on Radio Tubes Vacated

THE Circuit Court of Appeals has vacated an injunction obtained by the Radio Corporation of America which restrained Jacob Hohenstein, Louis M. Rosenthal and the Liberty Appliance Corporation, of New York City, from continuing an alleged infringement of the De Forest radio vacuum tube patents. The opinion of the court was to the effect that the plaintiff was without right to sue and that it had no title to the patents.

Sunbeam Has New Outlet for Its Goods

The Sunbeam Electric Company, 71 Third Avenue, New York City, has added a new outlet for its radio and electric products by the purchase of the business which has been conducted successfully for ten years by John Ryffel at 207 East Fourteenth Street, New York City. Complete radio equipment of Sunbeam standard will be available at either address.

A New One Tube Set

The Aldwin Radio Company, 676 Eighth Avenue, New York City, have brought out a new one tube set, using an original circuit of their own. The features claimed for the set are its remarkable sensitivity combined with simplicity of operation. The tuning is accomplished with a single dial. Stations can be tuned in or out with two

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NEW CONSTRUCTION

of all **FRESHMAN**

Variable Resistance Leaks

guarantees long life and permanent resistance—no pencil markings—assures an unbroken range of 180 degrees. Eliminates hissing. Clarifies signals.

A New Leak for

PANEL MOUNTING

Mounted on any panel in a few seconds—2 mounting screws serving as connections behind the panel.

Complete with either .00025 or .0005 mfd. Micon Condenser

$1.00

Without Condenser **75c.**

A necessary essential for every tube receiving set

At your dealers—otherwise send purchase price and you will be supplied postpaid.

Also ask your dealer for a free diagram of the Kaufman and Flewelling circuits.

Chas. Freshman Co., Inc.

106 Seventh Ave. New York City

BIG SLASH!

Cash with Order—Parcel Post Prepaid

$6.50 1½ V Tube for dry cells	$4.95
$5.00 Detector Tube, 6 V.	2.75
$6.50 Amplifier Tube, 6 V.	3.50
Welsh Peanut Tube, 4 to 6 volts, with socket	2.40
All above tubes fully guaranteed	
Thorardson Amp. Transformers	3.95
$1.50 22½ V "B" Battery	.85
$4.00 45 V "B" Battery	2.45
Federal or Brandes 2000 ohm Headsets	6.50
Dictograph 3000 ohm Headsets	6.90
Murdock 2000 or Gilbert 2200 ohm Headsets	4.40
$4.50 Acme Amp. Transformers	4.25
Sockets and Rheostats	.69
Panels, 7x10, $1.10; 7x12, $1.60; 7x14, $1.85; 7x18	2.80
23 Plate Condensers	1.29
43 Plate Condensers	2.69

PAULA RADIO COMPANY

233 West 34th St., New York City

JOBBERS

AND DISTRIBUTORS

Something New in Batteries.
Exceptionally Good Proposition.
Assigning Territory Rapidly.

Write or Wire

SIDBENEL, 25 Mt. Eden Ave., New York

GUAR. 1½ VOLT TUBES

$6.50 Detector and Amplifier for dry cells. Fits standard socket $4.95
3.00 Detector Tubes, guar. 2.75
6.00 Amplifier Tubes 5.50

To avoid delays check items and total amount.

B. B. RADIO COMPANY

2202 Mermaid Ave., Dept. W.4, Brooklyn, N. Y.
All Deliveries Made Within Two Days.

To the DX Nite Owls

and anyone else interested in radio! If you missed RADIO WORLD, dated Feb. 24, with the famous Flewelling Circuit, get it now and get your EARS WET! Send 15c or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

THE ANNIVERSARY NUMBER of Radio World was increased in size and is an exceptional issue. A few copies left at 15c. each, or you may start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

Partial Program of WGI, Medford Hillside, Mass. 360 Meters

Saturday, April 28, 1923.

6:00 P. M.—New England Weather Forecast, furnished by the U. S. Weather Bureau. Late News Flashes, Early Sports News—Boston American.

6:15 P. M.—Condition of Massachusetts Highways, furnished by the Automobile Legal Association. Amrad Bulletin Board.

6:45 P. M.—Code Practice, Lesson Number Forty-two.

8:00 P. M.—Evening Program.

1. Fourth of a series of talks on New England problems under direction of the New England Business.
2. Musical Program to be announced.

Sunday, April 29, 1923.

4:00 P. M.—Twilight Concert.

1. Concert by the Mal-Con Band of Malden; Mr. C. Roland Reasoner, Director.
2. "Adventure Hour," conducted by the Youth's Companion.

8:30 P. M.—Federation Church Service, conducted by Rev. Lyman J. Radcliffe.

Program of WGY for Week of April 29

ALL time references in the program of WGY, the Schenectady broadcasting station of the General Electric Company, are on the basis of Eastern Standard Time. Several changes have been made in the schedule to accommodate the program to all communities, whether under "old" or "new" time. The concert programs remains at 7:45 p. m., Eastern Standard Time, or 8:45 p. m. Daylight Saving Time.

Sunday morning and evening WGY will broadcast the services of the Albany Street Methodist Church and in the afternoon the WYG Symphony Orchestra will give a program assisted by soloists.

Thursday night, Winchel Smith's comedy, "The Fortune Hunter," will be produced by the WGY Players. During the first program, Friday night, May 4, "Daniel," nationally known sport writer of the New York "Herald," will talk on the prospects of the 1923 baseball season. A second address will be delivered by W. C. White of the Research Laboratory of the General Electric Company. Mr. White will talk on "The Radiotron."

At the late concert, Friday night, May 4, the Union College Musical Clubs will have the entire program. Saturday evening Cain's Castle Orchestra will play from 8 to 10, Eastern Standard Time.

Exchange Bars Stock Boosting by Radio

THE Governing Committee of the New York Stock Exchange, at its last semi-monthly meeting, adopted the following resolution:

"RESOLVED, That no member of the Stock Exchange, or firm registered thereon, shall make use of wireless or radio to transmit or broadcast market information or forecasts of business or financial conditions or any other matter intended to advertise such member or firm or to stimulate interest in particular securities or in the market; provided, however, that members may supply quotations to broadcasting stations which have been approved by the committee at such intervals and under such regulations as are prescribed by said committee."

A SENSATION

In New York and now Gaining an Enthusiastic National Reputation

KAUFMAN CIRCUIT

Designed by an Amateur and Dedicated to Radio Fans for Better Reception.

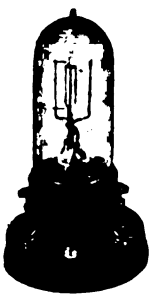
This Circuit acts like a three-star general, dependable, broad gauged and definite. It makes a recreation out of a fad. The wonderful results achieved on this marvelous circuit have forced us to turn over a New Department to handle the Kaufman Circuit exclusively for our Mail Order Patrons. You can get the whole circuit complete with a simple and clear diagram as follows:

KAUFMAN CIRCUIT, Drilled Panel, Active 20 Variocoupler, 46 Plate Vernier Condenser, Vern. Rheostat, Socket, 2 Variable Grid Leaks, .00025 Micon, .001 Micon, 34 Switch Points, 3 Levers, 2 Dials, 8 Binding Posts—ALL at This Specially Low Price. **$12.50**

Write out your order and pin a Post Office Money Order to it and Mail it to us. If you ask for our Catalogue, Given Free, you will learn of the Radio Instruments we offer for DX (Distance) work. Checks or stamps not accepted. Merchandise shipped postpaid East of the Mississippi.

D-X-Radio Co.

123 Liberty St. New York City



Na-ald W.D. 11 No. 411

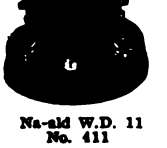
It's the contact that counts

The dual-wipe contact strips of the Na-ald DeLuxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties this socket keeps plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

Price 75c

The Na-ald Special Socket No. 499 is a sturdy little socket for the G. E. No. 199 dry-cell tube. It has special slot construction, and is molded of genuine Bakelite. The heat from soldering connections will not affect these sockets.

Price 75c
After May 20, 50c



Booklet with wiring design and instructions for Hazeltine's Neutrodyne circuit, together with other selected circuits, packed with each Na-ald product or sent in exchange for cover taken from any Na-ald carton.

Na-ald De Luxe No. 400

ALDEN MFG. CO.

Formerly
ALDEN-NAPIER CO.

Dept. L 52 Willow Street
Springfield, Mass.

NA-ALD

RADIO PRODUCTS

This tube, with an in-sealed contact point placed over the Crystal, will give better result. Mailed prepaid for 25c. (silver).

VACUUM ELECTRIC WORKS

Station C
TOLEDO, O.

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Answers to Readers of Radio World

Has RADIO WORLD *ever published a picture of Radio Photography? Who is responsible for the present invention?—James Mason, Three Rivers, Mich.*

RADIO WORLD first published a picture of this kind in its June 24, 1922, issue. It was of a photograph that was sent from Rome, Italy, to Bar Harbor, Me., in forty minutes, utilizing the invention of Dr. Korn, of Berlin. The present device is the invention of C. Francis Jenkins, of Washington, D. C.

* * *

Kindly publish a diagram of a one-tube reflex similar to that used by Lionel Bigman, illustrated in RADIO WORLD *for April 14.—C. T. Brown, 770 Flatbush Avenue, Brooklyn, N. Y.*

Herewith is a similar hook-up. It is a one-tube reflex that will permit you to use either a loop or an antenna by simply hooking either across the terminals marked A and B. The constants are marked so that

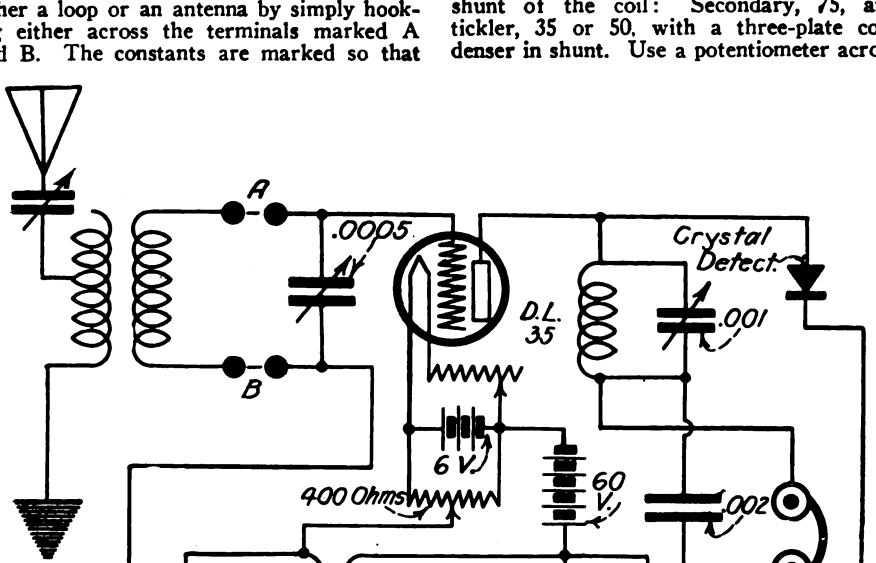

Diagram of a single tube reflex set using a crystal detector, asked for by Mr. C. T. Brown. Either tuner with antenna and ground or loop can be used simply by inserting the desired leads at A and B. If loop is used, the tuning is done with the condenser in shunt of it. The circuit shown is very selective and extremely sensitive, if a good tube is used.

no mistake can be made. The condensers .002 are fixed, and can be obtained at any radio shop. The variable condenser used in the plate circuit across the honeycomb coil should be one that has little dielectric loss, and the rotor side of the plates should go to the side connected to the audio-frequency transformer.

* * *

Inasmuch as the reflex circuit accomplishes the greatest detection and amplification for a given expense of tubes, why is it not more universally adopted? What are the objections to this circuit, if any? Where two stages of radio-frequency are used, is it necessary to alter the design of the transformer in the second stage?—D. S. McLane, 329 Harrison Avenue, Schenectady, N. Y.

The reflex circuit is very popular. Compared to other multi-tube circuits the reflex circuit is more widely adopted than any other. Because of the fact that it can be used with a loop antenna and saves tubes as well as current, by using one tube instead of two, it is the most economical circuit embodying radio- and audio-frequency. There are no objections to this circuit outside of the fact that the wiring is slightly more complex than most circuits, which is really not an objection at all. The same type transformers can be used in the first and second stages if tuned radio frequency is not used.

* * *

Using the enclosed hook-up with two stages of audio-frequency I am able to receive 360 and 400 meters, but when I attempt to receive KFI and KHJ on 430 the set seems to "freeze," and I can only hear them faintly through the interference of the other stations. What is my trouble?—Gene Ullemeyer, 1511 9th Avenue, Rock Island, Ill.

We note that you are using honeycomb coils. Try using the following for the primary 100, with the primary condenser in shunt of the coil: Secondary, 75, and tickler, 35 or 50, with a three-plate condenser in shunt. Use a potentiometer across the filament and battery leads to get rid of the bluing of the tube. Don't use so much filament current.

* * *

I am using a radiotron tube, on four dry cells hooked in series. Is this as satisfactory as a six-volt storage battery?—C. A. Waldron, 1330 West Broadway, Minneapolis, Minn.

From an operating standpoint it is as good, but from an economic standpoint it is not so good. A set of dry cells will last about 60 active working hours, using one tube, which is not much considering the amount a tube is really used. You can therefore readily see that the money spent in constantly renewing dry cells will be more in the end than the price of the storage battery.

* * *

Kindly give me hook-up employing variable condenser, variocoupler, two transformers, and necessary tubes and sockets.—Fred Bingold, Hudson Motor Car Co., 315 West 68th Street, New York City.

We refer you to the article by Arthur S. Gordon published in RADIO WORLD for April 14, where you will find the hook-up you desire.

I have constructed the receiver described by Geo. May, in RADIO WORLD *for July 1. It is the circuit using two variometers and a variocoupler. In the article it advises to tune the grid variometer between two squeals. I cannot even get the set to squeal, and signals don't come in any louder than on my crystal set. What can my trouble be?—Wm. C. Martin, Hand Station, Michigan.*

This circuit is the "old reliable" three-circuit Armstrong regenerative circuit, and you should get the squeals you mention. Try the following: Increase your B battery current and also put your grid variometer on the other side of the secondary (rotor) of your set, next to the grid condenser and grid leak. Use a variable grid leak resistance in the circuit.

* * *

I have constructed the set described in RADIO WORLD *for January 20 by Orthcrus Gordon and have not had much success with it, outside of burning out two tubes. I have seen two or three good reports on this circuit, and yet cannot seem to get it to work. I notice that the negative B battery goes to the plate. Is this right? Would this cause my tubes to burn out?—James Carroll, 24 King Street West, Toronto, Ont., Canada.*

The plus in this diagram should go to the plate. The fact that they are reversed would not tend to blow your tubes, but simply to render the circuit inoperative. The plus terminal of the plate should always go to the plate in any circuit. You must have your circuit incorrectly wired, in order to blow tubes with it. Trace your wires, and make sure that everything is correct.

* * *

What is necessary to obtain a license for the operation of a small transmitter?—Louis Gallinan, Box 83, Bridgton, Me.

In order to obtain a license for the operation of a transmitter it is necessary to do the following: Be able to transmit and receive signals at a fair rate of speed (ten words per minute; five letters constitute a word; so that is fifty characters per minute). Have a knowledge of the "Q" signals and their meaning and use. Know the international wireless regulations pertaining to the secrecy of messages and the operation of a station during a SOS call. Be able to understand and describe the receiver and transmitter that you are using.

* * *

I have built the set described by Orthcrus Gordon, but use a De Forest and U. V. 200 tube instead of the WD-11 mentioned. I get the music and talk but it is distorted. What is my trouble, and how can I remedy it?—A. R. Moulton, 114 Putnam Street, Watertown, Mass.

The fact that you are using different tubes should not make any difference in the operation of the circuit. Don't burn your tubes so high, and also sacrifice some of the volume for quality. A signal will sometimes be much cleared and distortion not so noticeable, if it is detuned a bit.

* * *

Can a WD-11 tube be used instead of a U. V. 201 in a circuit and what plate voltage will be required for it?—H. W. Zimmerman, 723 W. Washington Street, Jackson, Mich.

This particular tube can be used as either detector or amplifier and when used as amplifier should have either 45 or 67½ volts on the plates. These tubes will stand up to 150 volts on the plates, as stated in a recent article in RADIO WORLD.

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General Electric Will Erect Two New Giant Broadcasting Stations

PLANS are nearing completion for the erection of two more giant radio-broadcasting stations by the General Electric Company, according to an announcement recently made by Martin P. Rice, director of broadcasting for that company.

One of the new stations will be located near San Francisco and the other is indefinitely placed somewhere between the Pacific and Atlantic Coasts. Both will be modeled after General Electric Company station WGY, at Schenectady, N. Y., and the experience gained by the engineers in this station after fourteen months' operation will aid greatly in the plans to give radio listeners in other parts of the country a radio service of the highest transmission quality.

Mr. Rice recently returned from the coast after a tour of inspection. He was accompanied by Harry Sadenwater, engineer in charge of the technical operation of General Electric Company's radio-broadcasting stations. Sites were investigated in and near Oakland and San Francisco, Cal.; Denver, Col., and Dallas, Texas.

In each city visited Mr. Rice received assurance of co-operation from the local chamber of commerce and municipal officials, who were alive to the advantages and prestige which may accrue to the city which is the home of a powerful broadcasting station.

The expansion of radio broadcasting by the General Electric Company from one to three stations is part of a program agreed upon some time ago by the General Electric Company, the Radio Corporation of America and the Westinghouse Electric & Manufacturing Company. This plan contemplates the erection of nine large broadcasting stations. Of this number the Westinghouse now has three in operation—those at East Pittsburgh, Pa.; Chicago, Ill., and Springfield, Mass. The Radio Corporation has two stations under construction—one in New York and the other in Washington, D. C. The New York station—illustrated in RADIO WORLD for April 14, 1923—is on top of the Aeolian Building, on Forty-second Street, and will be opened in a short time. The General Electric Company now operates WGY at Schenectady, N. Y.

In discussing the plans of the General Electric Company, Mr. Rice said: "It is our conviction that the future of radio broadcasting will be on a plane of relationship with localized stations, similar to that of the national magazine to the local newspaper. Each will have its own functions—the local stations to carry events of local interest and larger and more powerful stations to transmit events of national import and interest."

Singer Claims Increased Popularity Accrues from Broadcasting

AN artiste who takes exception to the recent agitation started by many performers against broadcasting their music by radio is Vivienne Segal, the charming young star of numerous New York productions. She takes issue also with many music publishers, writers of songs and manufacturers of phonograph records who have lodged a claim in Washington for royalties from the radio-broadcasting corporations, saying that their popularity and that of their songs is hurt by being heard over the radio. On the contrary, it is the contention of Miss Segal that it heightens one's

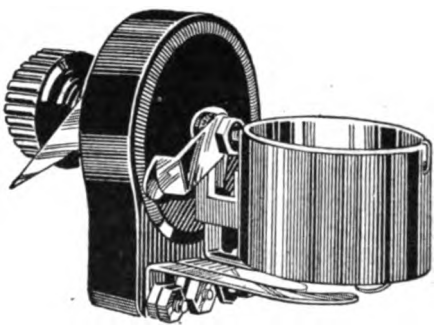
The Latest Book on Radio Telephony

William C. Ballard, Jr., Assistant Professor of Electrical Engineering at Cornell University, is the author of a very valuable addition to radio literature under the title, "Elements of Radio Telephony."

The reader with a technical background who desires to bring his knowledge of the subject down to date will find this exactly the book for the purpose. The radio enthusiast will find between its covers an excellent presentation of fundamental principles with their applications. The author is a recognized authority and the book is accurate, simple, clear, reliable and written in a pleasing style.

"Elements of Radio Telephony" retails for $1.50, and will be sent postage free on receipt of this price by the Columbia Print, 1493 Broadway, New York City.

AJAX SOCKET-RHEOSTAT



Combination Socket and Rheostat — Eliminates Wiring

A device for which amateurs and professionals have long been waiting.

A combination V. T. Socket and Rheostat for panel mounting which entirely eliminates separate leads between socket and rheostat and at the same time provides a panel-mounted socket without the use of additional brackets, thus materially simplifying the installation and hook-up.

Cat. No.	Type	Ohms	List Each
2007	A-1	5 with Knob and Pointer	$2.00
2008	A-2	5 ¼" Shaft without Dial	2.00

Unless otherwise specified, Type A-1 will be supplied.

FREDERICK H. PRUDEN
Incorporated
993 Bergen Avenue — Jersey City, N. J.

FOR ONLY $7.00
You get all the parts necessary to build complete
OUR RADIO PUP SET
We get favorable comments from all who have built it.
IT HAS MADE GOOD! THE BEST BUY OF ITS KIND EVER ASSEMBLED!
We have all the "Hard-to-Get" Radio Supplies at Prices That Are Right.
MAIL ORDERS PROMPTLY FILLED
Electric Service Engineering Co., 105 West 47th Street, New York
Bryant 2743

Greenwich Radio Co.
185 GREENWICH STREET — NEW YORK, N. Y.

PHONES
Berwick Supreme, 2200 Ohms.....$3.45
Potter, Loud and Sensitive.....$4.95
WEBSTER WOODEN VARIOMETER Tunes up to 1800 Meters.....$2.95
EAGLE MOULDED VARIOMETERS and VARIOCOUPLERS, List $8.00.....$4.95

Pathé Loud Speakers $17.50

AMPLIFIER TRANSFORMERS, Special for 1½ Volt Tubes.....$3.25

SEND MONEY-ORDER, INCLUDING POSTAGE. ALL GOODS GUARANTEED.

CORRESPONDENTS WANTED BY RADIO WORLD ALL OVER THE UNITED STATES AND CANADA
Send us your name and address and say that you want to become our correspondent. We will show you how you can represent RADIO WORLD in your locality and at the same time make money for yourself. We would particularly like to hear from those who are handling the "Saturday Evening Post."

Good Bye Aerials!

SHORT-CUT ANTENNA

(Pat. Pending)

Replaces aerials, loops, electric light plugs, etc. Eliminates lighting dangers. Reduces STATIC interference and distortion to a minimum. Brings clearer signals and truer tone. Works on all standard vacuum tube sets.

Postpaid, Anywhere, for $5.00

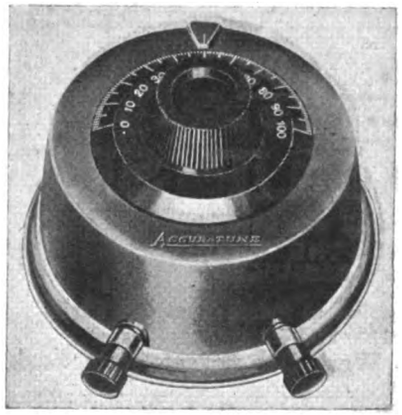
Satisfaction Guaranteed, or Money Refunded.

Short Cut Radio Corp.
243 West 54th St. New York

Makes Your Set Portable.

Size only 6¼ by 2⅛.

AUXILIARY TUNER



Helps Cut Out Those Interfering Stations

Not a mere wave-trap, but a high-grade tuner which when connected in series with antenna will materially improve the selectivity of the average receiver.

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Radio World, 52 issues, $6.00.

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From HLW to WOR and WOR to HLW

NOT long ago local radio fans at Williston, North Dakota, had the pleasure of picking up broadcasting station WOR, L. Bamberger & Co., Newark, N. J. On the evening the program from this station came in so clear the woman announcer of the station asked all listeners at a great distance from Newark to write that they had picked up the station. In response, H. L. Weatherwax, Williston radio fan, sent the following letter to WOR:

L. Bamberger & Co.,
Station WOR.

GENTLEMEN AND ANNOUNCER: Last evening I had to marvel at the (W) onders (O)f (R)adio because (W)e (O)verheard (R)eception of a (W)oman (O)f (R)efinement (W)ith (O)ur (R)eceiver. I (W)ish (O)ur (R)eply might contain (W)ords (O)f (R)espect for your (W)ish (O)f (R)eturn. However, (W)ith (O)ur (R)ambling of (W)himsical (O)ratorical (R)hetoric, I trust you will (W)rite (O)n (R)eceiving this kind (W)ish (O)f (R)egard.

Yours very truly,
H. L. WEATHERWAX.

In response the following was received last week from the broadcasting station at Newark, N. J.:

(H.) (L.) (W)eatherwax, N. D.

(H)onored (L)ong-distance (W)ireless Friend:

(H)ow (L)ong (W)e (H)ave (L)ingeringly (W)aited to say we (H)ave (L)iked (W)ords of (H)e who (L)istened (W)hen we broadcasted. (H)ow (L)ucky (W)OR (H)as (L)ately (W)andered to (H)omelike (L)ittle (W)illiston. (H)appiness, (L)ong Life and (W)ealth.

JESSIE E. KOEWING, "J.E.K.,"
Director, Chief Announcer and
(H)asty (L)etter (W)riter
of "WOR."

WOC Changes Its Wave Length to 400

STATION WOC, Davenport, Iowa,—"Where the West Begins"—has issued the following:

"Notice has just been received from the Department of Commerce that in accordance with recommendation of the Second National Radio Conference, recently held in Washington, each station is authorized to broadcast on only one wave length. This means that, beginning immediately, the Government Reports broadcast from WOC heretofore on 485 meters, will be sent out on the regular broadcasting wave of 400 meters."

American Telephone & Telegraph Co.'s Broadcast Schedule

MR. W. E. HARKNESS, Manager of Radio Broadcasting for the American Telephone & Telegraph Company, informs RADIO WORLD that it is the policy of his company to circulate its advance programs through the newspapers only.

The general schedule of broadcasting is as follows: On weekdays, 4:00 to 5:30 p. m.; evenings, 7:30 to 10:00 p. m., except Tuesday and Friday, when the schedule is 7:30 to 8:00 p. m. The Sunday schedule is 3:20 to 5:20 p. m. and 7:30 to 10:00 p. m.

Paris Catches Radio "Wild Cat"

"POSTE ZERO," which has so long disturbed the listeners-in in Paris has at last been discovered. The mysterious operator turns out to be a manufacturer of wireless apparatus who has been testing his installations over wave lengths equal to those of the Eiffel Tower. He has been warned to experiment on shorter wave

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12.00	Doubles	6.75
1.50	KLOSNER VERNIER RHEOSTATS	.59
4.50	THORDARSON Audio Frequency Transformers	3.25
5.00	FISHER Variocouplers or Variometers	2.50

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The Concentrated Portable Receiving Set

Reliable Range
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312-314 W. 14th St. Junction City, Kan.

Willard Radio Co.
Dept. R.W.
291 BROADWAY NEW YORK CITY

REINARTZ CIRCUIT
EVERY PART COMPLETE

1 Reinartz wound coil, 1 tube socket, 1 rheostat, 1 23-plate .0005 MFD variable condenser, 1 13-plate .00025 MFD variable condenser, 3 inductance switches, 10 switch points and nuts, 4 switch stops and nuts, 2-3" dials, 6 binding posts, 1 variable grid leak, 1 .002 MFD phone condenser, necessary bus bar wire, 1 high grade Radion panel and diagram and complete instructions..... **$10.00**

FLEWELLING CIRCUIT
EVERY PART COMPLETE

2 honeycomb coils, 1 2-coil mounting, 2 coil plugs, 3 .006 condensers, 1 variable grid leak, 1 grid leak 1 23-plate .0005 MFD variable condenser, 1 Vernier rheostat, 1 tube socket, 8 binding posts, 20 feet bus bar wire, 1 high-grade RADION panel, 1 3" dial and the Radio Digest Booklet on Operation and Construction of Circuit **$11.00**

Write for descriptive catalog. Shipped prepaid East of Mississippi River—others include Postage.

You Need It!

Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20?

This hook-up actually goes out and drags the distance in, and lays it at your table.

All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?

If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

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REINARTZ CIRCUIT

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1 Socket (Condensite)	.60
1 Rheostat Vernier	1.25
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1 Bakelite Panel	2.50
6 Lengths Bus Wire	.20
1 Audion Tube UV 200	5.95
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1 Cabinet, Mahogany Finish	3.75
Total	$28.83

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We will ship our sets anywhere in the U. S. and guarantee satisfaction.

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Helpful Hints to Hoosier Hams

DON'T fasten your antenna permanently to a bough of a tree if you want it to last. Fasten it by means of a pulley, with a heavy weight at the end, which will keep it taut, yet allow the tree to sway without breaking the wire.

The best possible ground is a wire dropped into a well, with a copper or zinc plate at the end of it. If you can't do this bury a dozen or so old tin cans and attach a wire to each one of them. This makes a good ground if the earth is moist.

Don't use an exceptionally long antenna just because you have the space to string it. Better results and sharper tuning will be obtained from an antenna 75 to 100 feet long than one of 200 feet, because the longer the antenna the broader the tuning on your set, and, consequently, the harder it is to tune in the long-distance fellows.

Keep your apparatus clean and free from dust if you want it to give you good service. A little bit of dust can form a high resistance leak across some part of your set, and you will wonder why it has suddenly lost its power to bring in the DX.

Don't use spring water in your storage battery. It may be the purest water in the state and yet contain enough mineral and metallic salts to ruin your battery. The cheapest way is to keep a supply of distilled water on hand. Boiled water is not distilled, so do not use it. It simply evaporates some of the water, killing the live organisms, and leaves the mineral and metallic salts in a stronger solution, if anything.

If you are troubled by clicking from party telephone lines run your antenna at right angles to the line, or, if that is not possible, put in a filter circuit, which will eliminate a great amount of it.

Don't run your antenna through trees. Trees will shield the antenna to a great extent, due to absorption, forming a sort of a protective screen around them, much the same as a tall building containing much steel will shield other buildings lower than it is.

If your set is located in the attic you can give your folks a chance to listen in by running wires downstairs and connecting a loud-speaker to them.

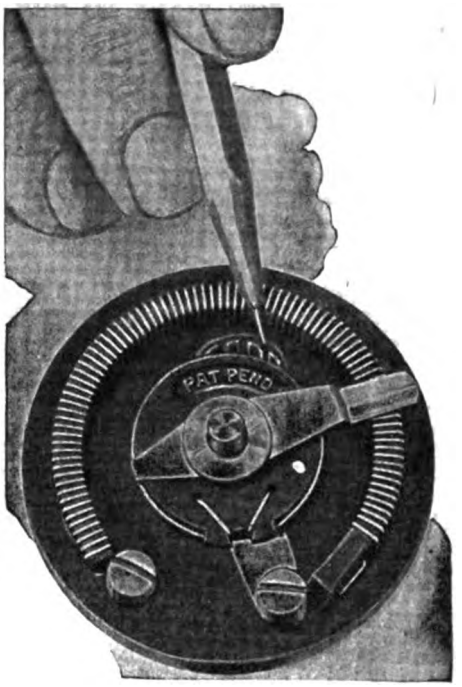
Every Electron a Miniature Radio, Says Sir J. J. Thomson

THE principles that underlie the electronic theory are essentially the same as make possible the sending and receiving of radio messages, it was stated by Sir Joseph John Thomson, the discoverer of the electron, before the Franklin Institute at Philadelphia last week in the fifth and last of his lectures on "The Place of the Electron in Chemistry."

According to Sir Joseph, who is Master of Trinity College, Cambridge, the electrons set up vibrations in the same way as do the sending apparatus of radio, and the wave lengths of the vibrations have been measured. The only thing the electrons lack is variable condensers, but these they hardly need.

The wave lengths between the electrons have been observed, and are known as photoelectric effects, according to Sir Joseph. The fact that mathematical calculations for their wave length practically check the recorded observation for several of the elements gives definite proof of the truth of the electronic theory, and vindicates the discovery of Sir Joseph.

Electrons are tiny negative charge points circling a positive nucleus in the atom. The degree of force exerted by the positive nucleus of the atom on the nearest electron determines the extent of the attraction or repulsion. The nucleus attracts the electron, but other negative electrons repel it, and



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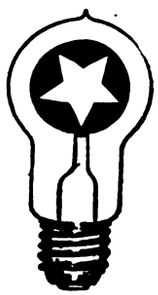

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TELEPHONE, BRYANT 4796

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M. B. HENNESSY, Vice-President

FRED S. CLARK, Secretary and Manager

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An Idea for the Experimentally Inclined

SOMETIMES, when a "ham" has made his set, and feels confident that it embodies the utmost of everything, he sees another circuit that captivates his fancy, and he is inclined to rip out the one he has just finished and build the new one.

This can all be eliminated in the following manner, when worked out neatly: Make up your panel, incorporating all the apparatus you can use, such as variometers, variocouplers, a couple of variable condensers, several values of fixed condensers, transformers and tubes. Then, instead of wiring them directly, bring each instrument out to small jacks, such as are sold in the stores and take up about an eighth of an inch of panel space. Now make up a series of small bridging cords with the plugs on either end. It will then be very easy for you to incorporate any number of hook-ups just by changing the connections. It is of course understood that all the apparatus is to be mounted on one panel, and that the panel will be large enough to accommodate everything. This is discounted by the fact that you can try out any number of queer circuits, just by shifting your cords.

Try it out, fellows! It works marvelously well and you can change your hook-up to suit your mood. If you feel like trying out an Armstrong, all you have to do is to switch your leads, insert your plugs, turn on the juice, and listen. Then if you decide that you would rather listen to the tune of a single circuit, it is a matter of five minutes to change your circuits through the agency

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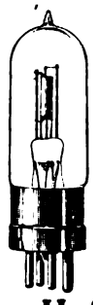

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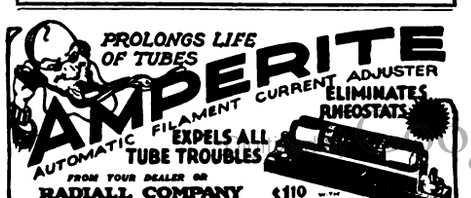

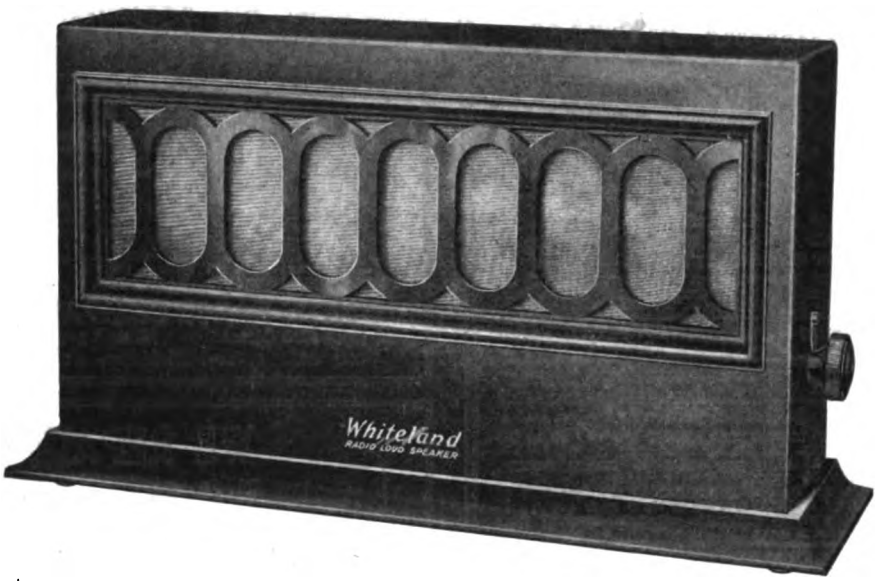

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Oak cabinet, two dials, drilled panel, vern. rheostat, vern. button for dial, eight rubber top binding posts, 23 p. A.B.C. condenser, variocoupler, socket, two fixed condensers, busbar and spaghetti. Together with simple diagram. Any boy can hook it up. Price.... $14.00

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The above can be used with any tube having standard base or W.D. 11 and U.V. 199 by using adapters.

This set has been and is being used in many of the Eastern States. We can furnish names of owners who have received Havana, Cuba, and Los Angeles from New York, Chicago, Davenport, St. Louis, Kansas City, Atlanta can be tuned in from N. Y. any night, and Kansas City, 1,250 miles from Scranton.

Mr. York, Scranton, Pa., has had Minneapolis, Minn., and Kansas City, 1,250 miles from Scranton.
Mr. E., Riverside Drive, N. Y., claims he gets Los Angeles any night after midnight.

Express or P. O. money orders accepted. Set shipped same day order received. Full description given above. At this low price we cannot bother with unnecessary correspondence.

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ADDRESS SERVICE EDITOR, RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

Amplified Three Thousand Billion Times

IMAGINE a man big enough to haul at one time all the freight moved in the United States in a year! But an average man could perform that super-Herculean feat if his strength were amplified as much as is the tiny flow of power from a radio-telephone microphone before it reaches the transmitting antenna.

In the studio of WEAF, the American Telephone & Telegraph-Western Electric radiophone station in New York, is a microphone of the condenser type. The minute capacity change which occurs when voice waves impinge upon the exposed plate of the condenser microphone causes a change in potential on the grid of a three-element vacuum tube.

This tube and others amplify the feeble output of the microphone and overcome the resistance of the wire line from the studio to the Western Electric Company's building on West Street. Here other tubes increase the power to such magnitude that they control the output of WEAF's high nower oscillator tubes. From studio to antenna the power is amplified three thousand billion times.

To help you conceive this figure, imagine what an average man could do if his strength were amplified to that degree! Imagine all the locomotives of the United States working at their highest capacity, moving the largest haul in our history, as they did in 1918. That year our total freight movement was 408,011,453,783 ton miles. Not only could this amplified man move all that freight traffic and replace all the locomotives in our freight service, but he would find the task as easy as you find lifting a four-ounce weight. This imaginary giant could perform a similar service for 400 countries at the same time, each handling a tonnage of freight equal to that of the United States. Not only would this giant be endowed with immense power, but were he as sensitive as the amplified current to the variations in the microphone circuit he could control this immense power with the utmost flexibility, increasing and decreasing the speed of the giant freight system between minimum and maximum as frequently as 3,000 to 5,000 times per second.

Lord Robert Cecil Instructs a Class by Radio

LORD ROBERT CECIL probably doesn't know it, but he acted as professor for "History Six," the class in Modern European History at Haverford College, Philadelphia, for three-quarters of an hour on a recent day. Dr. Kelsey, who is the usual instructor for this class, was anxious that his pupils should have the advantage of learning, first hand, about the League of Nations, and arranged to have a powerful three-tube receiving set and loud-speaker installed in the classroom so that the entire speech delivered by Lord Robert Cecil at the Bellevue-Stratford, and broadcast by Station WFI, Strawbridge & Clothier, could be heard. At 1:30 p. m. the class of thirty-five undergraduates, armed with notebooks and pencils, assembled in the classroom and listened to the distinguished English statesman until 2:10 p. m.

Radio Church of America

THE church will be brought direct to the people by radio under a plan proposed by the Radio Church of America, which has been incorporated at Sacramento under the laws of the state of California, and purports to be non-sectarian and non-denominational. Headquarters of the church are to be established in San Francisco. Branches will be established, according to the articles of incorporation, wherever and whenever a radio broadcasting station is available.

Facts About Foreign Radio Stations

IN compliance with a number of requests the following information is supplied by the Department of Commerce for the benefit of all concerned: Nauen, Germany, call letters, POZ; range, 6,500 miles; w.l., 3,100, 4,900, 5,600, 6,300, 8,700, 9,800, 13,000. Kootwijk, Sambeek, Holland, call letters, PCG; range, 5,000-6,000 miles; w.l., 6,250, 8,400, 12,500, 16,800. Stavanger, Norway, call letters, LCM; w.l., 12,100. Bordeaux-Lafayette, France, call letters, LY; power, 500 KW arc. Lyons, France, call letters, YN; power, 60-200 KW. Eiffel Tower, France, call letters, FL; power, 40 KW. Basse Lande (Nantes), call letters, UA; power, 200 KW.

Alaskan Radio Stations Reopened

THE following radio stations in Alaska have been reopened: KKA, Yakutat; KOXN, Pirate Cove; KJK, King Cove; KXW, Ikatan.

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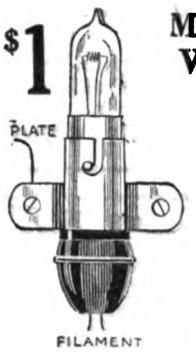

$1 Margo Detector Vacuum Tube

Operates on one dry cell with or without "B" battery. If your dealer has not stocked them send direct, adding 25c for socket and 5c for postage.

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13-Plate Precision Condenser	.85
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43-Plate Precision Condenser	1.55
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Freshman Variable Grid Leak	.55
Freshman Var. Leak and Condenser	.75
.006 Condensers (Flewelling)	.38
W.D.-11 Bakelite Sockets	.35
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The Fil-Ko-Stat is to all purposes "fool proof." Each instrument is packed with the maker's guarantee that it will be replaced if broken within one year.

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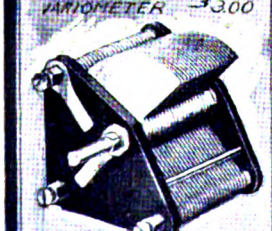

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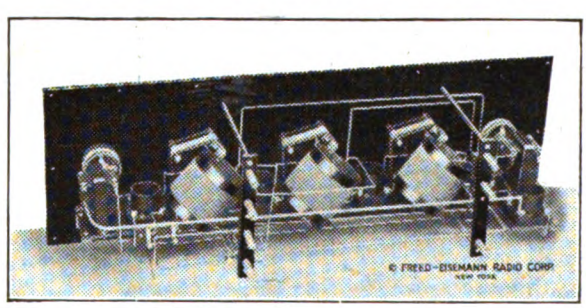

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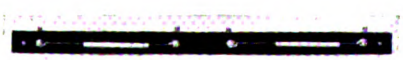

MODEL 352—2 capacity balance adjustment Neutrodons mounted on bakelite, in one unit. Total, $2.00.

Freed-Eisemann apparatus is guaranteed. If your dealer cannot supply you—write us.

Send 5c. for catalogue or 25c. for wiring diagrams and descriptive matter.

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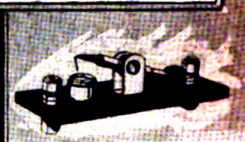

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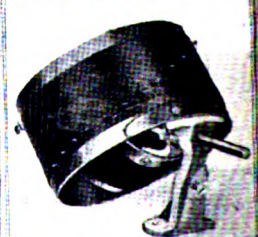

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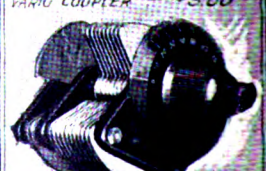

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The Broadcasters-Composers-Producers Muddle

THE royalty drive directed from several vantage points at the broadcasting statons of the country goes on, aided by a lot of publicity for all hands. Everybody concerned, outside the radio field, seems to have developed an insatiable appetite for royalties.

George Schubel, executive secretary of the Radio Broadcasting Society of America, charged that the American Society of Composers, Authors and Publishers had cast a "funeral pall upon all broadcasting activities."

James J. Foley, president of the Society of Radio Artists and Audiences, an organization supplying talent for radio programs, declared the music writers had taken an "unpatriotic, unsportsmanlike and purely commercial attitude."

J. C. Rosenthal, secretary of the composers' organization, said: "It is going to be the absolute ruin of the music publishing industry if the radio men do not recognize our copyrights."

These developments followed the refusal of WJZ, Westinghouse station, to take out a license.

Officials of the Radio Broadcasting Society of America are quoted as saying that there was not a chance of their compromising.

Several radio clubs, who have remained anonymous up to date, have started a boycott and passed resolutions to the effect that "under no condition whatsoever shall any member for any reason buy any sheet music, phonograph records or piano rolls controlled by the American Society of Composers until they withdraw the fee laid upon the broadcasting stations of the country for broadcasting any of their compositions."

Arthur Hammerstein announced last week that the Producing Managers, New York City, have taken up the subject of radio broadcasting and have appointed a committee of which he is chairman to look into the subject of royalties for the use of compositions now current on the stage as radio material. "The sale of sheet music and records," he said, "is likely to be harmful to patronage since they are permanent fixtures in the home and are available for reproduction at any time. On the other hand, the broadcasting of the music through the air is a transitory operation that is calculated only to whet the appetites of those who hear it for more of the same."

Representatives of 60 broadcasting stations from twelve states met at Chicago last week, organized the National Association of Broadcasters, and prepared to press an effort to prove their right to broadcast copyright music. Radio concerts, they assert, have been "dry" for the past few weeks because all the popular songs were barred. The broadcasters maintain they make no money but give the music much free advertising. They say they will carry the case to the Federal Supreme Court on this basis if necessary. Thorne Donnelly of Chicago was elected President of the organization.

To many anxious inquirers: RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

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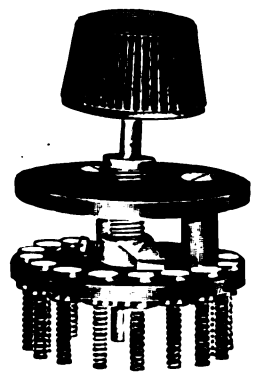

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GUAR. 1½ VOLT TUBES

$6.50 Detector and Amplifier for dry cells. Fits standard socket	$4.75
5.00 Detector Tubes, guar	2.75
6.00 Amplifier Tubes	3.50
1.50 22½ Volt B Battery	.79

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RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.
The Rand McNally Radio Map of United States is 28x20 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

Price 35c Each

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1493 BROADWAY NEW YORK CITY

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 6. Whole No. 58 | May 5, 1923 | 15c. per copy, $6.00 a year

The Convenient Multi-Jack—How to Make it

By Arthur S. Gordon

SOME amateurs exercise all degrees of ingenuity when it comes to fastening the cord tips of two or more head phones together. Most of them, however, are content with a makeshift arrangement which must be disturbed every time an extra pair of phones is inserted in the hookup, while others are always at odds for a short piece of wire with which to make a temporary splice. If they are lucky, the splice will hold good for the evening, but experience demonstrates that this rarely happens. The usual result is that one of the listeners suddenly finds himself cut off from the concert, or all the listeners are annoyed with heavy and constant clicking of which there seems to be no explanation. The need for perfect connections where all the phones are joined together is just as imperative as the same need elsewhere in the circuit. To insure these connections, and to lessen the trouble oftentimes experienced, the multi-jack arrangements described in this article are presented for construction.

The devices can be very easily put together from standard parts, with very little workbench experience. They may be made to accommodate three or four headsets, or even five, if it has been found by experience that your set will operate that number.

Two designs are shown, one for the convenience of amateurs who do not employ jacks and plugs, and the other for those who do. The first design (Fig. 1) shows a piece of bakelite or panel material of any kind 1½ inches by 4½ inches, upon which are mounted four single circuit jacks. The jacks are connected in series, and come in the circuit from left to right. That is to say, unless a pair of phones is plugged in on jack No. 1, jack No. 2 is inoperative. Both these jacks must be occupied before No. 3 becomes operative, and so on.

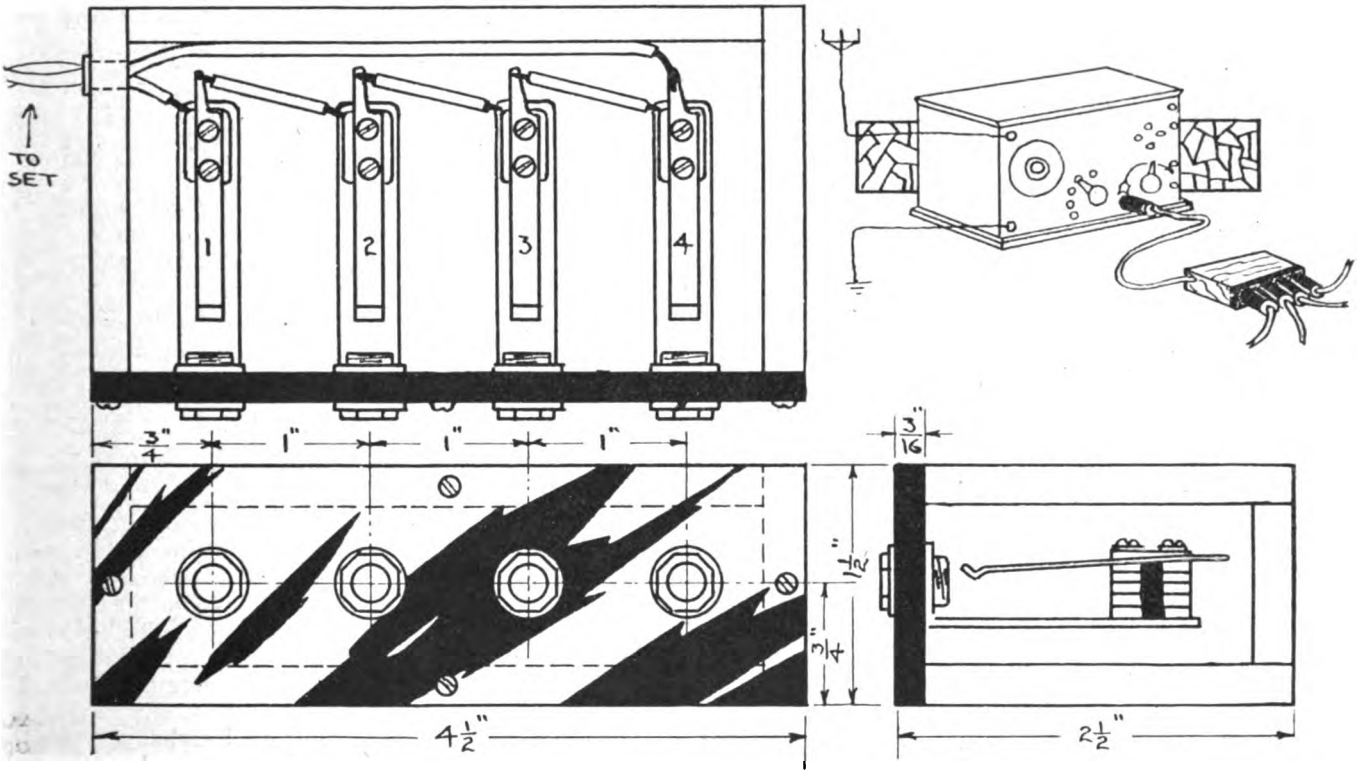

Fig. 1. Layout for making a multi-jack to accommodate four headsets.

All the connections are soldered and the whole instrument is enclosed in a neat polished wood box. The leads are brought out through a hole in one end of the box, and are fastened at the other end to a plug, which is used in the set proper as though attached to a single pair of head phones instead of to a multi-jack. Lamp cord is excellent wire for this connection, and it need not be very long.

(*Continued on next page*)

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New Wave Lengths For Class A Stations

By Carl H. Butman

WASHINGTON, D. C.—Six Class A stations, the first of the newly classified broadcasters, were licensed during the past week by the Radio Section of the Department of Commerce. Texas, Oklahoma, Illinois, Pennsylvania, Louisiana and Indiana each received one station with a wave length exclusive for its respective district.

From the schedule of wave lengths for Class A stations, printed below, it will be seen that at least twenty distinct wave lengths in each of the nine radio districts are available for distribution by the local inspectors. Three or four wave lengths in each district will be reserved for the best of the local stations of this class, these waves not being assigned to stations in the immediately adjoining districts. This gives the better of the A broadcasters a partially exclusive transmitting wave. For example, the wave length 222 meters may be assigned to stations only in the 4th, 5th and 8th districts; similarly, the wave of 233 meters will be authorized for use only in the 2d, 5th and 7th districts, while waves 224, 226, 229, etc., in column two, will be allocated in every district. This plan, it is believed, will tend to prevent considerable local interference, and create virtually an "A-1" class of stations within the general A class.

District radio supervisors, as they are called, are assigning Class A waves now, but the transfer of B stations from 400 meters will not be made until noon on May 15.

In the distribution of 582 broadcasters by districts on April 1, the 9th, the largest, including the states of Indiana, Kentucky, Wisconsin, Illinois, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Colorado and the upper part of Michigan, is seen to be in the lead with 190 stations, followed by the 8th, which includes lower part of Michigan, Ohio, West Virginia, and largest parts of New York and Pennsylvania.

The distribution of broadcasting stations in the Nine Radio Districts as of April 1, 1923, is as follows:

Dist.	1	2	3	4	5	6	7	8	9	
Class A...	27	19	37	31	65	63	56	71	183	—Total 552
Class B...	1	5	4	2	3	4	1	3	7	—Total 30
Total	28	24	41	33	68	67	57	74	190	—Total 582

Most of the stations designated here as A are now operating on the wave length of 360 meters, but will be placed in Class C on May 15 if they desire to continue on 360 meters.

Class A Broadcasting Wave Lengths

Frequency. kc/s	Wave Lgths. meters	All Dists.	Dists.	Frequency. kc/s	Wave Lgths. meters	All Dists.	Dists.
1350	222		(4-5-8)	1190	252		
1340	224			1180	254		
1330	226			1170		256	(1-3-6)
1320		227	(1-6-9)	1160	258		
1310	229			1150	261		
1300	230			1140		263	(2-5-7)
1290		233	(2-5-7)	1130	266		
1280	234			1120	268		
1270	236			1110		270	(4-7-8)
1260		238	(1-3-6)	1100	273		
1250	240			1090	275		
1240	242			1080		278	(1-6-9)
1230		244	(2-4-9)	1070	280		
1220	246			1060	283		
1210	248			1050		286	(3-8-9)

Six New Class A Broadcasters Licensed

Call	Station	Frequency kc/s	Wave Lengths Meters	Power Watts
KFFZ	Al. G. Barnes Amusement Co., Dallas, Texas	1330	226	20
KFGD	Chicakasha Radio & Electrical Co., Chickasha, Okla.	1210	248	20
WABA	Lake Forest College, Lake Forest, Ill.	1130	266	100
WABB	Lawrence, Dr. John B., Harrisburg, Pa.	1130	266	10
KFFY	Pincus & Murphy, Inc., Alexandria, La.	1100	275	100
WRAF	Radio Club, Inc., Laporte, Ind.	1340	224	10

The above stations were licensed during the week ending April 20, 1923, by the Department of Commerce and will start transmitting on their respective lengths at once.

(*Concluded from preceding page*)

The second design (Fig. 2) is for use with cord tips only. Amateurs who prefer plugs, of course, cannot use this device. It consists of a bakelite strip one inch wide by 5⅜ inches long, with two end pieces (made either of wood or bakelite) screwed or bolted

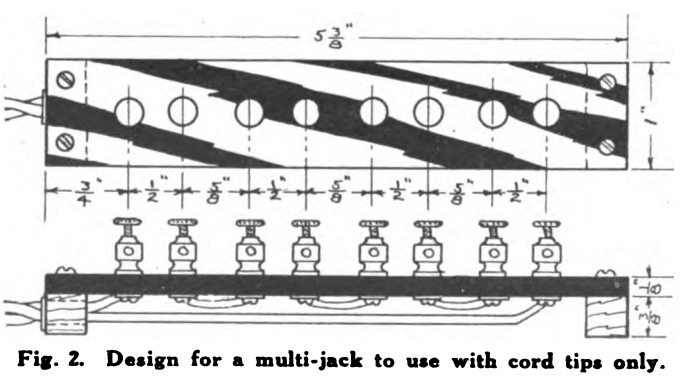

Fig. 2. Design for a multi-jack to use with cord tips only.

on. Standing upright upon this strip are eight binding posts, set apart in four units of two binding posts each. The connections are made as indicated in the drawing, and terminate either in cord tips or in a plug. Perhaps this second design, with its leads fitted to a plug, is the more economical if not the neater of the two multi-jacks submitted. Amateurs who build either of these devices will find their time and money repaid in a very short time by greater convenience and less annoyance

The multi-jack may be fastened either to the table or not, according to the wishes of the builder. It is better, perhaps, as a loose instrument, for often on a crowded operating table it can hang down below the table top where it will take up no room and yet is easy to get at.

The paramount advantage of the multi-jack is the ease with which a pair of phones may be inserted into a radio circuit or withdrawn from that circuit. Incidentally the cord tips of the phones do not become frayed from constant binding, and there is a noticeable increase in all around efficiency and convenience. For the amateur who constantly keeps two or three and sometimes four headsets in the circuit, this device is indispensable.

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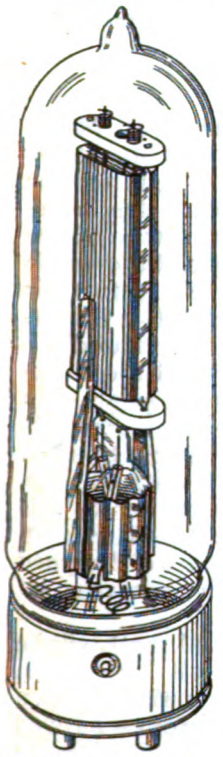
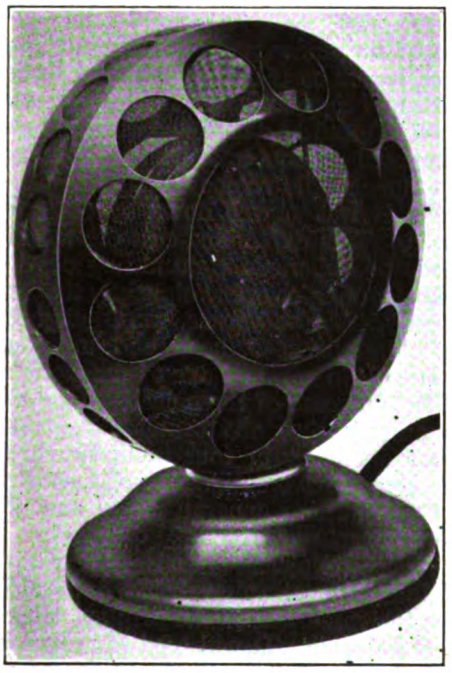
WHAZ, Rensselaer Polytechnic Station, Broadcasts Both Entertainment and Instruction

ONE of the radio broadcasting plants which has established many enviable records is WHAZ, the radio station at Rensselaer Polytechnic Institute, Troy, New York.

The equipment was installed primarily as a part of the lecture and laboratory equipment in the course in communication engineering which is given at the institute, and was not primarily meant for the regular broadcasting work as it is utilized today. The apparatus had been installed in units, in such a manner that each could be adjusted and corrected as a separate unit, without relying upon any of the other apparatus. When this apparatus was originally installed it was found that with small additional cost, it would be possible to combine both the regular routine work and public broadcasting. This course was determined upon.

When the first actual program for this station was proposed, it was the intention of the operators to use mechanical music, such as player pianos and victrolas, but the demand was found to be so great for really interesting programs, that a regular broadcasting schedule was laid out and programs similar to the other stations were promulgated. The original purpose of the station was to test fading and directional effects and this was carried on by means of outside reports with the aid of many thousands of listeners as well as the occasional research expeditions of the students and professors.





(C. Western Electric)

Figs. 1 and 2. On the left is shown a 50-watt tube such as is used on the transmitter at WHAZ. The condenser-microphone, shown on the right, is one of the latest developments in the field of microphones, embodying the carbon-disc or grain principle.

The broadcasting apparatus consists of a Western Electric 500-watt transmitter and receiver for monitoring purposes, a regulation spark transmitter, a continuous wave Colpitts oscillator circuit transmitter, which is used as a small power telephone transmitter for short work and also as an instructional set for experiments in the laboratory.

This station has been heard in Lakeport, California, a distance of 2,500 miles air line, which is somewhat of a record for a station that started out as an educational feature of this most up-to-date institution. For this last reason it is somewhat different from the usual broadcasting station, as it is used not only for the purpose of entertainment for the outside world but also as a means of practical instruction in this latest of arts, the theory of which is studied as a part of the college routine.

When the station was first opened it was decided to run test programs on the second Monday of each month; but after serious thought, and in cooperation with the popular desire, it was found necessary to put on a regular program, utilizing student talent in the form of orchestras, glee clubs, lectures and general information, such as might

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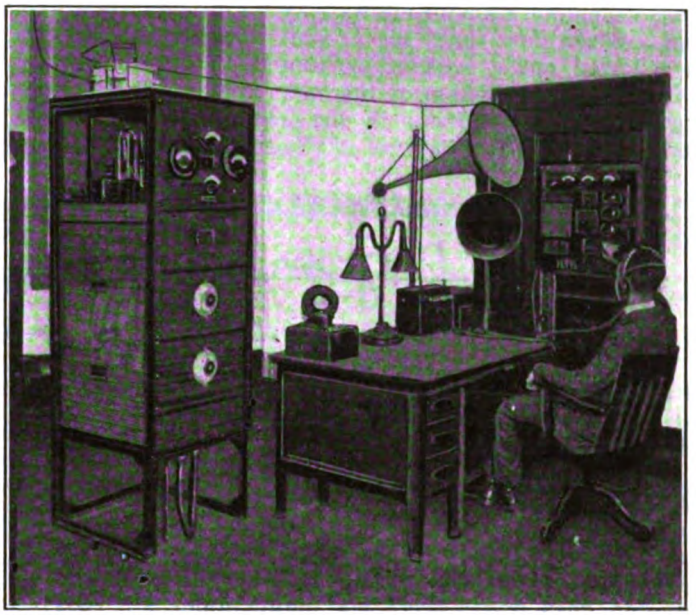
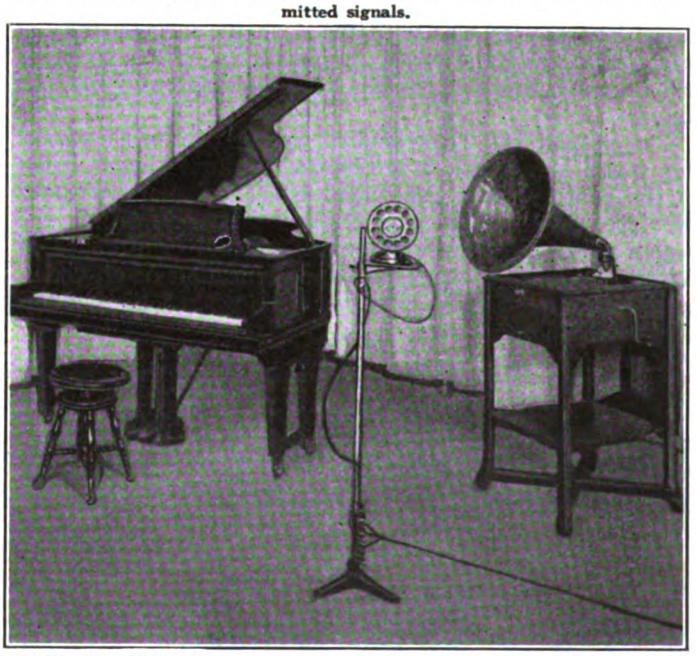


(C. Western Electric)

Fig. 3. Control room of Station WHAZ. The transmitter is shown on the extreme left and the speech modulating and amplifying apparatus on the right. The operator listens in continually to check up on the transmitted signals.



(C. Western Electric)

Fig. 4. The studio at Station WHAZ. Heavy draperies and carpets are used to deaden the room because of the propensity of the sensitive microphone to pick up outside noises.

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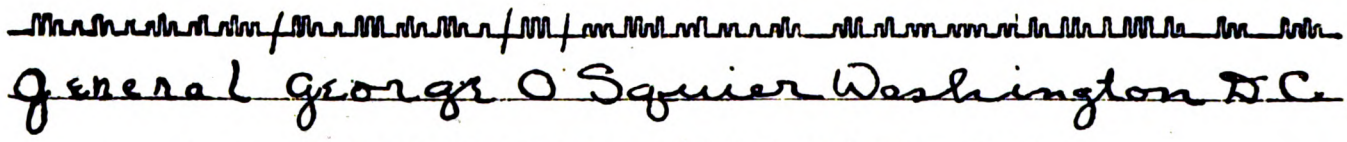
Gen. Squier Invents New Alphabet for Radio Telegraph and Cable

Will Increase Transmitting Speed Nearly Three Times

WASHINGTON, D. C., April 25, 1923.—A new telegraph alphabet for use in radio telegraph and cable in all languages has just been given to the world by Maj. Gen. George O. Squier, Chief Signal Officer of the Army and one of America's most prolific electrical communication inventors. With his new code system a speed 2.65 times the present transmitting rate can be achieved, and it is easier to "tune to."

The first presentation of this new "universal" code was made yesterday afternoon by the General in a speech before the National Academy of Sciences in Washington.

The present telegraph alphabet was invented by Professor Morse in 1844 before the telephone, alternating arc or radio transmission, and yet, with advances in nearly every other phase of communication we have continued to use the same alphabet which, it was pointed out by General Squier does not fit. It was for this reason that General Squier "redesigned" the 80-year-old alphabet for 1923 use. In the old alphabet the dots, dashes and spaces required different time for transmission, whereas the new plan provides for sending each in the same space of time. In his system in alternating current, no consecutive signals



Sample record of telegraph message as recorded by General Squier's new alphabet.

It now appears that the code used for almost 80 years will be superseded throughout the world with a gain of over 150 per cent in speed.

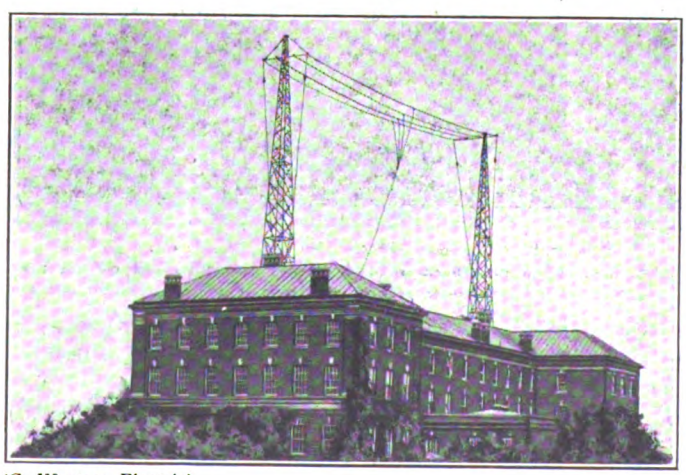
Briefly, General Squier proposes to vary the amplification or intensity of each half cycle of alternating current to send a dot, space or dash each of which require the same time of transmission. The signals are distinguished in receiving by the three different amplitudes, one each for the dot, dash and space. Six permutations are possible with the three intensities; one arrangement being to represent the dot with a certain intensity, the dash with a larger one and the space with a smaller amplification. The method tried successfully by General Squier in the Signal Corps laboratories was with the dash the largest, the dot intermediate and the space the smallest. Other methods will be tried, however, and a better arrangement may be found.

The system has been studied by radio experts of the Army and Navy who, it is reported, find no "bugs" in it; on the contrary they see added efficiency, and decreased interference. It is the plan of the inventor to submit the system to the next International Technical Conference of Telegraphy, with a suggestion for unification of all codes, radio, wire and cable, using the same system of modulation for the signals.

are of the same sign, but different amplitudes. In Morse such letters as S and H required three or four signals of the same sign and were not as legible as the signs for the letters A and N where no two signs were alike, they being composed of dots and dashes. The several letters of the old alphabet did not have the same legibility and the whole alphabet was slowed down by the "slow" letters to their speed. This defect has cost the world hundreds of thousands of dollars in transmitting costs, it is estimated.

In forming the new alphabet, the letters used most frequently, like the vowels, were assigned short signals. In the old alphabet O the second important letter in English, next to E in use, was one of the worst and longest to send, being composed of three dashes, requiring 11 units of time, counting dashes and spaces. General Squier sends this important letter in four units, nearly three times as fast. We should have designed our alphabet before we designed the transmitting apparatus it is now thought, whereas we worked backwards.

The new alphabet is easier to learn, it is said, and will be of international value, being applicable to all languages. The increased use of the printing telegraph makes it even more valuable. It will tend to reduce interference as well as atmospheric through the ability of receiving stations to tune in both high and low frequencies, experts believe.



(C. Western Electric)

Antenna equipment of Radio Broadcasting Station WHAZ.

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be found interesting to outside listeners. These first programs awakened such a decided interest throughout the entire country that it was definitely decided to continue the programs and even enlarge them to meet the popular idea and demand. This has been done and several of the original features of the station have been changed to accommodate the public.

Probably one of the most novel features of this college station is the fifteen-minute talk every Monday evening on an educational subject, such as might prove helpful and interesting to the radiophone listeners.

At the time of the reception of this station in California, a fan was giving a radio party to the brotherhood of his church. There were 150 present, the great majority of whom had never "listened in." The reception from this particular station was amplified by a Western Electric loud speaker in connection with a power amplifier, and the entire program was audible from start to finish, in the 50x90 hall, in which the California party had gathered.

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"PWX Is Easy Using This Circuit and One Tube"

The Stockelberg "Pup" Circuit

By Robert L. Dougherty

IN these trying times when every "ham" who owns a receiver nearly breaks his neck—or his set—to get distance so many circuits pop up that it is impossible to even keep track of them, much less give them more than a cursory trial, before something else jumps up and demands to be tried out.

A circuit recently perfected by Mr. Stockelberg, a prominent Boston amateur, is so simple to construct and easy to work (it has only one control) that it is a crime for even the most hardened fan to pass it by without giving it a trial. And if he just gives it a trial he will be convinced that it is "a real circuit."

The arrangement is described as a reversed Hartley circuit, which is an adapted Armstrong single circuit

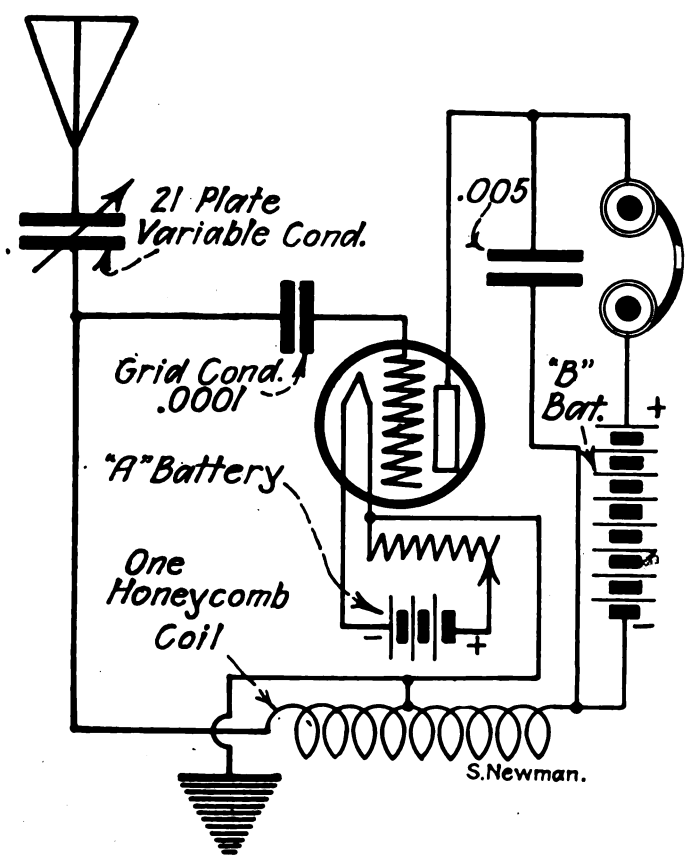

Fig. 1. The "Pup" circuit. Note that the honeycomb coil is tapped. The correct point for this tapping is explained in the text.

with several improvements which make it surprisingly selective and wonderfully sensitive. As can be seen from the diagram, a D-L 75 honeycomb coil is used. In the drawing it appears to be tapped in the center, but such is not the case. It should be tapped at about the twelfth turn, in a 75-turn coil and about the eighth or ninth turn in a 50-turn coil. It is not necessary to use the same size coil, as coils up to 150 can be used, tapping them about two-thirds of the way, as this seems to be the governing factor in the circuit. A little experimentation in that way will determine the best point, as when it is once discovered it does not have to be changed, and the lead can then be soldered on.

The tuning is accomplished by the 21 plate condenser which is located in the antenna circuit. This is the one and only tuning control and, for best results, should have a vernier button on the panel of the type that sets outside the periphery of the dial. The

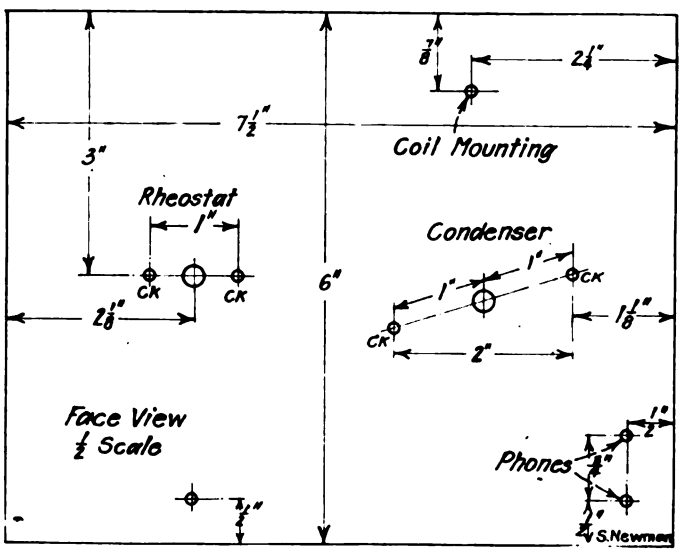

Fig. 2. Panel layout with all measurements. The panel is small, because the apparatus is arranged to take up little space, and there is only one control.

panel for reasons well known to anyone who has used a single regenerative circuit should be well shielded with either tin or copper foil, taking care that it does not short any of the leads. In order to eliminate any

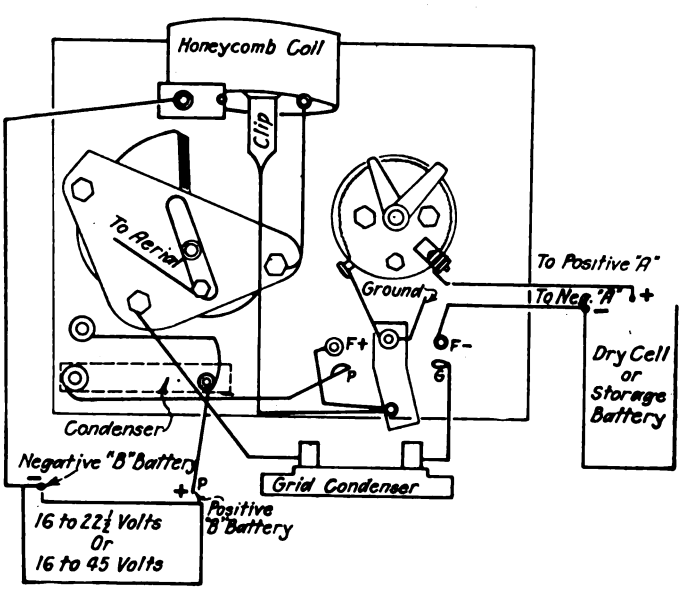

Fig. 3. How the apparatus should be mounted on the back of the panel with wiring diagram repeated for the benefit of those wanting to know how to arrange wiring.

other trouble, connect the rotor side of the variable to the antenna side of the circuit when hooking up.

The elements needed for this new and popular cir-

(*Continued on page* 10)

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Radio and the Woman

By Crystal D. Tector

A VERY good friend of ours who recently acquired a reflex loop set wanted to take it across town to her mother, who is very ill, and unable to get out of bed. Not having a car, she put it in the perambulator and then, to assure herself that it was not broken, she turned on the tubes and of course was gratified to hear it working. The loop she stuck on top of the hood, after first turning the hood down. She had gone about a block when the set jogged and the battery made connection and started talking. As luck would have it she was at that time just outside a school and all the kiddies, who were going home, stopped, looked, listened, and started in to follow her, begging her to turn it on again. Some grown-ups seeing the crowd of boys following, sheep-like, followed too, just bursting with curiosity and begging her to turn it on. She became so embarrassed she said she felt that her face must have been burning up and she almost started to cry, when one woman approached her and said: "My, my, isn't that a novel way of advertising radio? My dear, will you bring one like that around to my house tonight? Maybe John will buy one, when you demonstrate it." She said she was never so embarrassed in all her life, but when she visited the woman and explained, the woman asked her if she didn't think it would be a good idea to equip some perambulators like that and try and sell radio sets by that sort of demonstration. Well, all I think is that some people just fall into luck.

* * *

Friend Husband brought a very distinguished Japanese student home the other evening and told me that he was studying law in his office, preparatory to taking a course in international law at one of the big universities. Of course we showed him our radio and to our surprise, he started in to tell us how far advanced his own country is in that particular line, saying that his father had endowed a college in Tokio for the express purpose of radio research work. He talked very interestingly for some time. I had thought that Americans were the only people who knew anything of importance connected with radio, until I met him. He actually talked like a college professor, warming up to a lecture on advanced science before a class of post-graduates. He was worth hearing.

Wouldn't it be grand if you could actually call up your favorite broadcasting station and ask to have your request number played? And also, wouldn't it be grander yet if the bootleg tubes would work as well as the regulars—or last half as long?

* * *

I notice in all the pictures I see of broadcasting studios that the singers and actors appear in costume. This puzzled me at first. What does it matter what they wear as long as their audiences can't see them? I have decided, however, that actors and singers are so accustomed by long training to "dress the part" that they might not do as well if they failed to wear costume. In this case, at least, "atmospherics" are a good thing.

* * *

The other day I read where a woman was suing her husband for a separation, charging cruelty. Her contention was that he came home, ate his supper, rushed up to the garret where he had a radio set and sat three until all hours of the morning. She said that she had forgotten that she had a husband at all, except when she had to wake him up in the morning. Well, I cut the piece out of the paper and laid it alongside of F. H.'s place so that he would see it when he came home for supper. He walked in and was all beaming, as he told me that I ought to have heard the story that one of the fellows told him in the train, coming home. It was the same story that I had cut out of the evening paper. "It's too bad that that poor Gump didn't think quick enough when he was putting in his set, to put it in the parlor, so that his 'disgusted darling' would have gotten the bug and been as interested as he was." Well, all I can say is that some men have brains and others just part their hair.

* * *

Don't you think that she is foolish? I do. I think that if I had been in her place, I would have done one of two things. I would have invited him to bring his set downstairs, or else I would have climbed up to the garret with him, and when the steam went down I would have shivered so much that he would have taken compassion on me—if radio leaves that in your system—and gone downstairs.

Radiograms

WOAW, the new $55,000 radio station of the Woodmen of the World, is broadcasting regularly from the roof of the nineteen-story W. O. W. building in Omaha, Neb.

* * *

The telegraphers' unions are discussing the possibility of establishing a "Morse Day" throughout the United States on which to honor the inventor of the telegraph and have suggested that the day be April 27.

* * *

George Hill Lewis, assistant to Powel Crosley, Jr., president of the Crosley Manufacturing Company, Cincinnati, home of radio broadcasting station WLW, is the owner of the first government license issued to a wireless operator. It was granted to Mr. Lewis in 1911.

* * *

The appointment of George K. Burgess as Director of the Bureau of Standards has been announced by Secretary Hoover, after a conference with President Harding. Mr. Burgess has been Chief Physicist of the Bureau and will succeed Dr. S. W. Stratton, who resigned several months ago to become President of the Massachusetts Institute of Technology.

Experiments made by Nebraska Wesleyan University based on thunderstorm reports furnished by the Weather Bureau are reported to lead to the conclusion that there is no relation between barometric pressure and audibility. A nearby thunderstorm area tends to reduce the audibility at the receiving station.

* * *

WSY, the broadcasting station of the Alabama Power Company, at Birmingham, Ala., sends out return postal cards with a request for comments by those who have picked up features on its programs. Over 1,000 letters were received from every State in the Union praising the singing of the male quartette of Tuskegee Institute, broadcast by WSY.

* * *

Dr. Schuyler Skaats Wheeler, inventor, engineer and physicist and President of the Crocker-Wheeler Company of New York and Ampere, N. J., died suddenly at his home in New York City on April 20. Dr. Wheeler was famous for his inventions of electric appliances, drives and motors. He was the designer of the "C. & C." motor, the first manufactured small motor for practical power work in the world. Dr. Wheeler was the organizer and founder of the United Engineering Society. He bought in Europe and brought to this country the Latimer Clark library, the largest collection of rare electrical books in existence, and presented it to the American Institute of Electrical Engineers, of which he was a past president.

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Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained in Simple Language for the New Radio Enthusiast

By Lynn Brooks

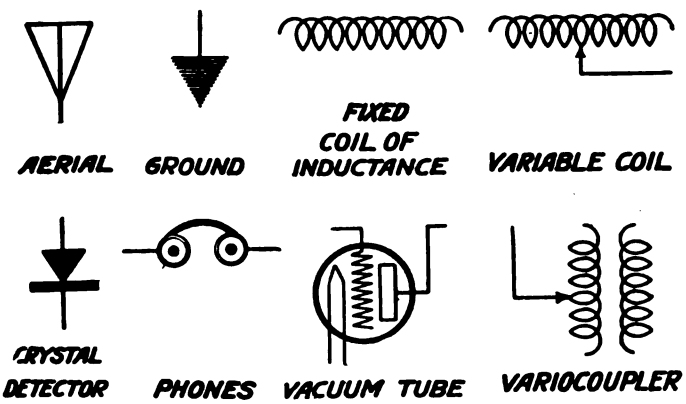
TUBE-DETECTOR: A rectifier which depends upon the theory that a heated filament in an enclosed exhausted space, will emit negative electrons. These detectors, or tubes, contain three elements—a plate, grid and filament. In short the theory is as follows: A positive charge is put upon the plate by means of a high voltage battery connected to it. The negative electrons emitted from the filament will, by nature, follow a path across the grid to the plate. This grid is alternately negatively and positively charged, by means of the condenser in the grid circuit. When it is negatively charged, it forms a screen to the electrons emitted from the filament because negative poles reject or repel each other. When this condition exists in the tube, no signals will be heard in the phones. The condenser when positively charged, changes the polarity of the grid to positive which allows the electrons to pass and carry one-half of the cycle over to the plate, causing signals to be heard on the phones.

PLATE: One of the elements in the tube detector. Generally it entirely encloses the other two elements of the tube. It is made of nickel composition. In small power tubes and detector tubes there is no oxide on this plate, but in the larger tubes handling currents up to 1,000 watts the plates are coated with an oxide.

GRID: A spiral wire enclosing the filament and situated between the filament and the plate, acting as a gate to allow the electrons to flow, or stopping the flow, depending upon the condition of its polarity.

FILAMENT: A fine tantalum, tungsten, or platinum wire which is heated by means of a battery. In the old style tubes these filaments are not coated; but in the latest models both the 6-volt and the 1½-volt tubes have an oxide coated filament which does not need to be heated to extreme incandescence in order to operate the tube at its maximum. Some of them operate at such a low temperature that the filament is not brought beyond a very faint cherry red glow. This is because in coating the filament with an oxide a greater electronic emission is provided for a given amount of current than could be had by using a bare wire. This wire is extremely thin and fine, often being no greater in diameter than a human hair. They are about one inch in length in the 1½-volt tubes, or about three inches long in the other tubes, doubling back and forming an inverted V in appearance in the larger tubes.

PHONES: A means of making the received signals audible to the ear is necessary in a receiver. To accomplish this certain apparatus is necessary, and this we know as the phones. Phones, or telephones, are composed of a case, either metallic or of some composition, within which are two high resistance magnets, the poles of which are permanently magnetized. The magnets themselves are wound with thousands of turns of very fine wire, No. 40 being generally used. Of course the many thousands of turns that are necessary, make the resistance of the magnets very high. It is a mistake to consider a phone in terms of resistance. It would be better were they considered in terms of ampere turns. Across the front of these magnets, and separated by a very small space, is a thin piece of iron or steel which is magnetized and drawn



Symbols used in drawings and illustrations to designate the different parts used in radio circuits and sets.

toward the magnets whenever a current of electricity flows through the magnets. As the rectified signal is only one-half of the phase of the received signal, the current flowing through the magnet is consequently intermittent, allowing the magnet to attract the diaphragm and release it some thousands of times a second.

DIAPHRAGM: The diaphragm of a phone is a thin circular piece of steel which fits over the rim of the phones and is separated by a minute distance from the pole piece of the magnets. Its vibration, caused by the current flowing through the magnets, allows the received signals to be heard.

Washington, D. C., to Get Another Broadcaster

THE Chesapeake and Potomac Telephone Company announces that by May 15 Washington, D. C., will have another broadcasting station. It will probably be a Class B station with an individual wave length which will reach to all corners of the nation. This company, which is a part of the American Telephone and Telegraph Company, has started the erection of the second of the Bell System broadcasting stations, and plans to duplicate in power and quality the New York station WEAF.

A unique feature is that the new plant will be a public service station; that is, it will be operated without profit and may be leased or chartered by other interests for periodic broadcasting at a rate equivalent to the proportional cost of operation.

It is understood that a local broadcasters' association may be organized and the operating time of the station scheduled to care for its members. This, it is believed, will save small operators considerable money in comparison to the costs of installation and upkeep of private broadcasting stations. Certain hours of any schedule would be reserved by the telephone company for the transmission of matter of public interest such as presidential addresses, congressional debates and governmental information. Important concerts broadcast from WEAF in New York may be sent by land line to Washington and broadcast simultaneously from the new station, officials say.

The electrical equipment is the product of the Western Electric Company, and will be installed under the direction of C. & P. and A. T. & T. Co., engineers. The station will be located on the telephone building, 725 13th Street.

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Naval Radio and Aircraft More Necessary Than Gun Elevations

TECHNICAL experts are arguing whether or not, under the Arms agreement, the gun elevations of the American first line battleships may or may not be increased, when what we really need is radio and airplanes. In order to increase the range from around 21,000 yards to 24,000 yards several degrees of elevation would be necessary, but with this increase neither the gun pointers nor the lookouts on the masthead could see where the shells fell. Airplanes with radio transmitters are the only means whereby battleships can fire with any degree of accuracy over 22,000 yards or about eleven nautical miles. Radio-equipped airplanes are also of great service under that range, especially in the case of a smoke screen which would make a target invisible from the ship itself.

Due to the curvature of the earth, a rangefinder in a fighting top about a hundred feet above the surface of the sea, can observe the water line or horizon approximately eleven miles distant, which is the resulting limit of accurate fire if he does his own spotting. That is, if the observers endeavor to tell the gun captains below how much short or over the target their shots fall or how far to the right or left, eleven miles is the maximum range.

For fighting top observations over this range much taller masts would be needed or airplanes which can spot by radio. To see the water line at 30,000 yards a fighting top would have to be 170 feet aloft—too high for practical purposes by many feet. Of course, a masthead lookout a hundred feet above the sea could see the mast and perhaps the superstructure of a ship over the horizon, but he could not see the fall of the shells in the water or their splash, and would only be able to tell if the mast or superstructure were hit, which would not aid the gun pointers in picking up the target.

It is for this reason that airplane spotters which can ascend several thousand feet, are used in the Navy and it is only by radio that they can report to the gunners the exact spots where the shells fall, thus enabling them to correct their aim.

What we need as much as gun elevating, some experts think, is more naval air spotters radio-equipped.

(*Concluded from page 7*)

cuit are so limited in extent that any fan ought to find most of them right in his shop. Then, with an hour-and-a-half's time, he should have a "pup set" set up and bringing in the DX. The bill of materials follows:

Bakelite panel, 6x7½x¼	$1.50
1 3-inch dial	.50
1 Vernier button-panel mount	.20
1 Vernier rheostat	1.25
2 Brackets—1 large—1 small	.23
4 lengths bus bar wire	.20
1 Grid Condenser, .0001—No leak	.75
5 Binding posts	.25
1 Condenser, .001 fixed	.25
1 21 plate condenser	1.50
1 DL-75 Honeycomb coil	1.62
1 Single mount for Honeycomb coil	.60
1 Socket for tube	.75
Total	$9.60

Additional apparatus, if no tubes or batteries are on hand:

1 Dry cell tube	$6.50
1 A battery	.40
1 B battery	1.50
1 pair of phones	5.00
Total of entire set	$23.00

This set, when made up for the newcomer in the radio field, or the old "hard-tack," does not cost a mint of money, and at the same time is sensitive enough to satisfy the most hardened DX Nite Owl, in his hunt for freedom and the open spaces.

The panel layout for the set is given herewith, and all dimensions are all worked out completely, so that the prospective builder should not worry about details. Drill your holes carefully, being sure to make the holes for the condenser from a template. If you do not get a template with the condenser, do the following: Take a fairly stiff piece of paper, or a card, and make a hole in the upper center of it, of sufficient size to accommodate the shaft of the condenser. Then with a pencil, find and pierce a hole for each of the standards of the condenser, taking care that the card or paper is held perfectly still, and does not move. Then use this as a template, by pasting it on the wrong side of the panel, and drilling through the center of the marks you have made.

A back view of the panel is also given to show the location of the various pieces of apparatus, as laid out for efficiency and short leads. Extreme care should be taken in the wiring, making sure that you run the wires correctly. Too much care cannot be taken in wiring a set, and ten minutes spent tracing the wire after you have finished may save a disgusted builder and probably a burnt out tube. Note the fact that there is no grid leak used in this circuit.

Consider that you have built the set, wired it up, and are ready to listen in. Turn on your tube about three-quarters and turn the condenser toward zero. If the set is functioning properly, the click or squeal of regeneration will be heard and, if a station is operating, the carrier wave of the station will be heard. Using your vernier button on your condenser, tune between the two squeals, and if the voice comes in muffled, turn down the filament battery a bit. This may cause the signals to die out entirely, and if such is the case, turn up the rheostat, one notch at a time, until the squeal is again heard. Then turn down just one notch, and bring the vernier of the rheostat into play until the voice or music is plain and unmuffled. Then leave it entirely alone, and do all your tuning with the condenser for the rest of the evening, unless the battery runs down. Then you will have to tune with your vernier rheostat again.

If when you are tuning in you do not get the set to function properly, try another tap on the honeycomb either nearer the center or further away, always one turn at a time. When the right spot is found, as before stated, solder it, and leave it alone, because it will remain the same unless a different antenna is used.

This set has been tried and found true. It works on an antenna 40 feet long and only 25 feet high with remarkable selectivity, even though ten stations could be brought in within 10 degrees. Because of the fact that it is so simple to construct and operate it should prove extremely popular. The only trouble that can be experienced is that of tapping the honeycomb coil, and that cannot really be called trouble if care is taken in doing it.

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Navy Electrician Designs Efficient Four Tube Transmitter

A VERY neat, compact and efficient transmitter has recently been made by M. Bebaut, chief electrician at the Radio Center, Navy Headquarters, New York City. The circuit employed is the original Colpitts oscillator, using grid modulation. With this set distances of 1,800 miles have been covered constantly on CW, and 900 to 1,200 on phone and buzzer modulated CW.

Referring to the diagram of the circuit published herewith, it will be noted that the four tubes (CW-931 5-watt tubes) are hooked in parallel, as to plate and

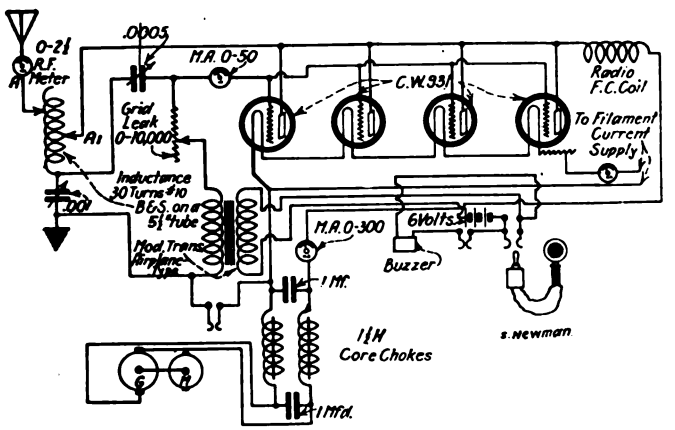


Fig. 1. Hook-up of circuit used by Chief Electrician Bebaut.

grid, and the filaments are all in series. The current for the filament is taken directly from the 110-volt line, using four 60-watt bulbs in series-parallel, in series with a 6-ohm rheostat, in the positive lead on the tube side, for finer regulation of the filaments.

The current from the plates is derived from a standard Westinghouse Electric motor-generator unit which delivers up to 550 volts to the plates, through two 1½-henry iron core chokes, with two 1 mfd. condensers at either end to remove the ripple. The motor of this unit is driven from the 110-volt line, through four 100-watt bulbs in series-parallel.

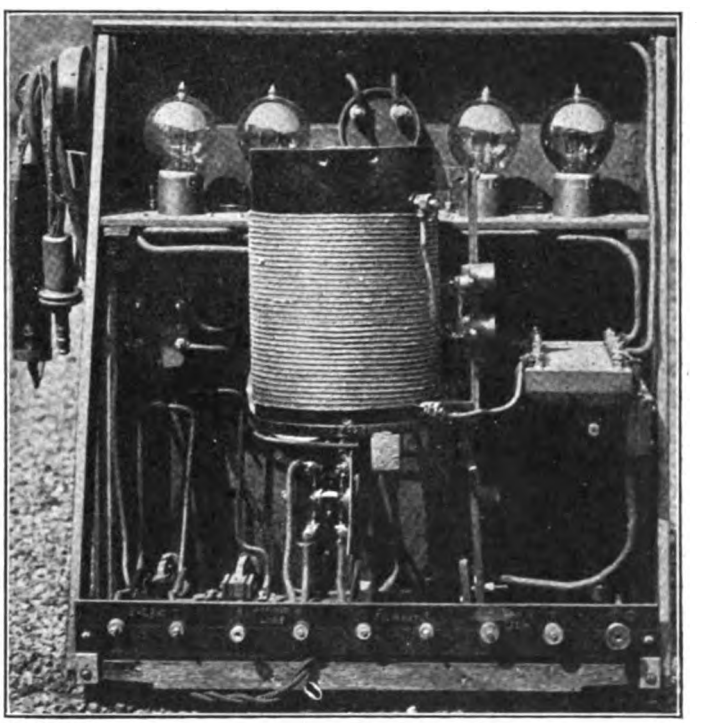
The modulation of the set is accomplished through a modulation transformer in the grid circuit, the secondary of which is in series with the 0-10.000 ohm leak of the non-inductive type. This transformer is the airplane type commonly used now on all of the U. S. Navy destroyers, on their intermediate wave sets. For CW the key is inserted directly between one leg of the generator, which goes to the filament side, and the grid side of the circuit, as illustrated. This has been found to give the best results as concerns the space current when using straight CW, because there is less fluctuation at the break and make of the key.

An important part of the set is the tuner, which as shown consists of 30 turns of Brown & Sharpe No. 10 insulated wire on a 5½-inch core. The important part of this tuner is the fact that the two sliders for antenna and plate tuning are attached to one another, approximately 5 to 7 turns apart, and they are both tuned together. On the antenna tuning switch is a piece of metal, which shorts the rest of the coil that is not being used, doing away with the dead-end effect, and at the same time giving much sharper tuning.

When it is desired to use the set in phone work the plug is inserted in the extreme right hand jack. The jack immediately next to it is for buzzer modulation, and the key is inserted in it for ICW.

An air core choke coil is inserted in the plate lead of the last coil. This choke is necessary to keep the plate circuit from backing up and down when fluctuations in the plate circuit occur.

The other illustration shows a comprehensive interior view of the set as well as all the apparatus and the controls. When the set was planned it was thought necessary to have a wave change switch to allow transmission on 150 meters; but when this was attempted, it was found that the change meant that the



(C. Photonews.)

Fig. 2. Interior view of Chief Electrician Bebaut's four-tube set.

whole tuning would have to be readjusted, so it was dropped and transmission on 200 meters was set.

The antenna used for this set is a six-wire cage antenna T type, 50 feet in length and 32 feet in height, situated at the extreme lower end of New York City in the U. S. Naval Communication Bureau's Office. With this set which is rated at 20 watts, using four 5-watt CW 931 tubes, stations in St. Louis have been consistently worked. Stations in South Carolina have picked up this station on both CW and ICW and once reported receiving phone for a short period.

Coming! New List of Broadcasters!

While the Department of Commerce has assigned wave lengths for each of the broadcasting zones established by the recent Second National Radio Conference, individual assignments of station wave lengths have not been announced. They are being arranged as rapidly as possible and as soon as finished A COMPLETE, UP-TO-DATE LIST OF BROADCASTERS will be published by RADIO WORLD.

The allocation of wave lengths for Class A stations appears elsewhere in this issue of RADIO WORLD.

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Developments of Vacuum Tube Research

By F. S. McCullough

Research Engineer, Westinghouse Electric & Mfg. Company

A PERSON using a vacuum tube seldom realizes that this tube is not a development of recent years. It has a long history back of it. The forerunner of a vacuum tube was the experiment of Edison in 1883, when he observed an electric current between the plate and a hot filament in a vacuum. Simultaneously some German scientists were working on it. The work of Edison was followed by Preece, Fleming and Thompson, English scientists. It was not until 1899 that Sir J. J. Thompson suggested an explanation of this phenomenon. About this time Marconi introduced radio telegraphy. Sir J. A. Fleming applied the vacuum tube for detecting radio signals in 1904. In 1905 DeForest, the American, changed this vacuum tube. The new tube was able to amplify the signals. Then in 1913 E. H. Armstrong invented an electric circuit, which with this tube was capable of producing oscillating currents suitable for sending radio waves or regenerating received signals. By regenerating we mean multiplying these signals hundreds of times. This briefly is the history of the tube you are using.

Larger tubes of this type are used at the broadcasting stations. For transcontinental telephone transmission, telephone companies are using a similar tube. In appearance, it looks somewhat like an electric light bulb. It has a glass bulb for maintaining a vacuum. This is sealed in a metal base. Mounted inside the tube you can see a heated filament surrounded by a complicated metallic structure. A radio engineer would tell you this was the grid and plate, and if you examine carefully, you will see that the outside of the structure is a thin metal plate formed into a cylinder or an oval. Between this plate and the filament, you will see a wire coil or a mesh. This is the grid. Now imagine a stream of electrical particles shooting out from the filament and across the space through the grid to the plate. This grid acts like a door. By opening and closing this door you can vary the amount of current that goes through; only you open and close this door electrically, and not mechanically. Just like a small child can open a door for a grown up person, so can the small electric currents open a door for large electric currents. That is exactly how a vaccum tube works.

To produce this tube, the scientists and engineers had to solve quite a number of technical and scientific problems. Years of research and millions of dollars were spent on developing the materials, the methods and the machinery for the manufacture of these tubes. To give you an idea of what these problems are let us compare the vacuum tube to an electric light globe. In the latter we have a vacuum which has about one-millionth of ordinary air. In a vacuum tube there is ten million times less air than in an electric light globe. Imagine the trouble of getting this vacuum. When you get nearly this far, the glass walls and the metal parts inside of the tubes begin to give off gas. Before vacuum tubes were invented, the scientists did not even know that the glass and the metals could contain gas. Now they had to find a way to remove the gas, and make sure no more gas would come out after the tube is in service. It may be interesting to observe that with all this vacuum an average receiving tube will still contain about ten to twenty billions of atoms of gas.

You have seen tubes with a bright filament and a dim filament. Some need a storage battery while others will burn with a dry cell. It is seldom realized that dry cell tubes take only one twentieth as much power as a storage battery tube, yet give the same service. However, a large amount of experimental work had to be done before this small amount of power could be made to do the work. The engineers had to develop a filament of extremely fine dimensions. This filament is one fourth of one-thousandth of an inch thick and ten-thousandths of an inch wide. This means that it would take four thousand of these filaments to make up on inch if laid side by side. This filament must be then coated in a delicate manner with a layer of active material. When you consider that it must be mounted in the center of the coil one-sixteenth of an inch wide, you will get some idea of what the difficulties are. The other extremes in vacuum tubes are the power tubes at the broadcasting stations. These tubes are made at the present time in sizes which range up to 1000 kilowatts. This means that they are capable of delivering about 1300 horsepower of radio energy to an antenna. Of course, no broadcasting station is now allowed to use such an amount of energy. When this will be allowed one broadcasting station will be able to reach the extreme ends of the earth. This day is not far distant. A few years from now you may be able, on your set, to listen to one station in London and another in Pekin.

Warning Against Fake Radio Inspectors

A "FAKE" radio inspector has been issuing "licenses" to amateur and boradcasting stations in Minnesota, the Department of Commerce has been advised. Using the return stub of an amateur application blank secured from the department, an individual giving his name as Cecil Osborne is said to have supervised the installation of a radio station in Minnesota and issued what he called a license.

This impostor claimed that he was a former radio operator of the Navy Department and a member of the Naval Reserve. The only record of a man of that name in the files of the Navy Department, is that of a deserter who served for a time as an apprentice and seaman. He deserted in San Francisco in July, 1922, the official records state.

All radio inspectors of the department, the officials in Washington point out, are supplied with means of identification, including official badges and identification cards bearing their photographs. Amateurs and broadcasters are advised to ask for identification cards and to pay no fees for licenses. Although the White Radio Bill contemplated the payment of fees for licenses, it failed to pass. The present law provides for the licensing without charge.

OUT-OF-PRINT ISSUES OF RADIO WORLD

TO RADIO WORLD readers who want copies of our issues of April 22, May 20, June 24, Oct. 21, and Dec. 2:

These issues are out of print. If you have any copies of these dates and will send them to us, we will send you current issues for them. If you have ordered any of these issues from us, please let us know if you wish to have us return the money to you, or send you current issues.

Radio World, 1493 Broadway, New York.

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How to Make a Built-up, Sectional Aerial Mast

By Arthur G. Shirt

AMATEURS who live in isolated buildings are often confronted with the problem of how to hold up the far end of their antenna. There are no trees or other buildings conveniently near, and a pole or mast of some kind seems to be the only way out of the difficulty. The expense involved in buying and erecting a mast of suitable height cannot always be met; moreover, there is always the problem of transporting a ready-made structure of lengthy proportions. These considerations are often the only reasons why some radio fans do not own their sets, and it is to help them that these plans for making a really ingenious mast from a few lengths of 2x4 studding are here presented.

The mast in question stands 36 feet high. It may be

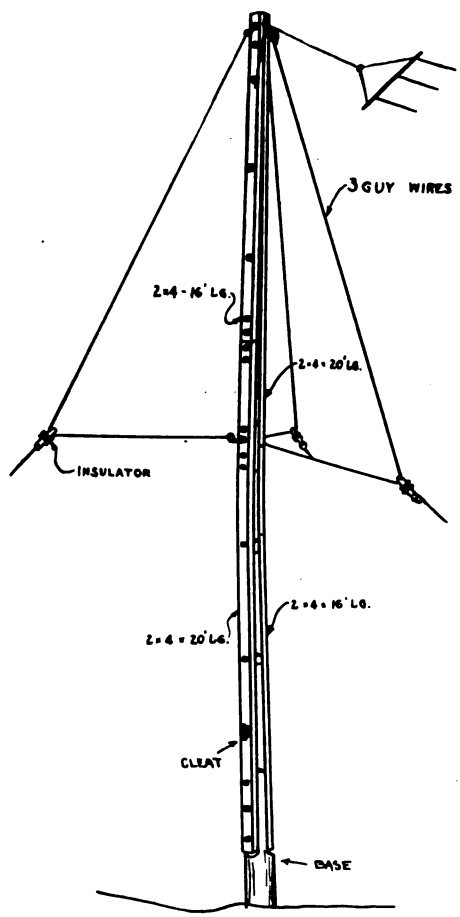

Fig. 1. Sketch of mast as it should appear when erected. It is guyed in the manner shown, which eliminates the necessity of using many guy wires.

extended to any greater height up to the reasonable limit of from 60 to 70 feet. It is easy to make, easy to raise, and once up, is guyed so that it will stay up. Its sturdiness is beyond question, yet it is neither heavy nor bulky. It has been designed for the special use of radio amateurs, and has been tried out successfully in a number of cases. A careful study of the accompanying sketch will reveal the many desirable features of this built-up, sectional mast.

It is made of the following materials: A fence post eight or nine feet long by eight inches in diameter; four lengths of studding, two pieces 20 feet long and two 16 feet long; a number of insert blocks of varying thickness; six closed hooks for the guy wires; a pulley, or block, and three insulators. To this list of articles may be added three turnbuckles to keep the guy wires taut.

The fence post is buried about five feet in the ground. It serves as the base for the mast. After being well embedded it is dressed down with an ax for about three feet of its upper portion, the dressed part being five inches wide. This rectangular head serves not only as a pivot about which to elevate the mast, but also as the initial in-

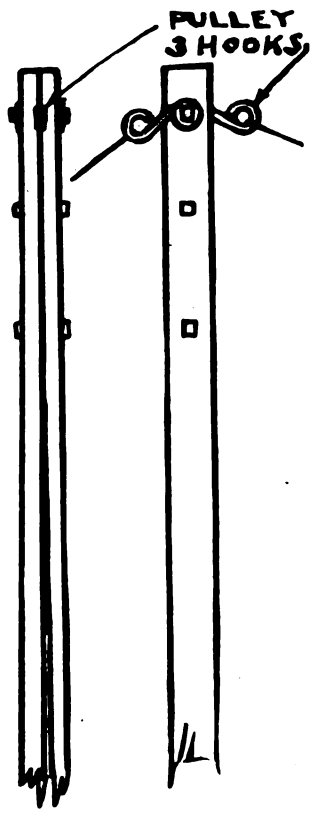

Fig. 2. Method of attaching guy wires to hooks.

sert block. In the case of a 36-foot structure as shown, the width of the mast at the bottom should be about five inches. As the mast increases in height above 36 feet, however, this block should be made wider, so that the entire structure keeps its proportion. Three bolt holes are drilled in a vertical line as shown in Figs. 1 and 2 and the spaces left between these holes are later duplicated upon the lower part of the two joints which are used for the bottom section of the mast.

The second insert block is 4½ inches wide. There are seven blocks in all, placed about as shown in Fig. 1, each tapering slightly and decreasing in width as they near the top. Note that the third and fourth insert blocks are at

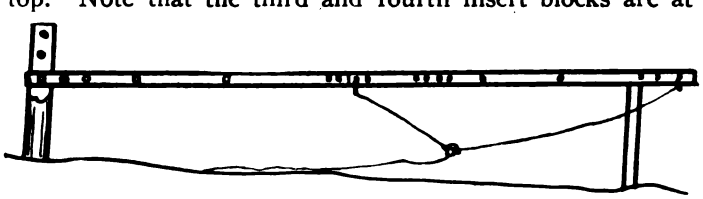

Fig. 3. Attach the guy wires before raising the mast. Then, when it is up, slip the necessary bolts in place, tighten and pull in on the guy wires by means of turnbuckles, making sure that the tension on each wire is the same.

the joints, and are therefore longer than the others. Also note that the joints are made on opposite sides and the mast is so assembled that they are six feet apart. This feature of the construction is an essential one, since it adds

(*Continued on next page*)

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Important Meeting of Radio Interests Discusses New Wave Lengths, Royalties and Price-Cutting

NEWARK, N. J., April 26.—Matters of interest to both dealers and manufacturers were discussed at a joint dinner-meeting of the Radio Manufacturers of New Jersey and the Radio Trade Association held at the St. Frances Hotel tonight.

President LeFevre, of the Sheltone Company, in opening the meeting outlined the purposes of the New Jersey Manufacturers' Association and spoke of the great interest and enthusiasm already shown by the members, though this was only the fifth meeting of the association.

Mr. C. B. Cooper of the Crosley Manufacturing Company, Cincinnati, who is a member of the Hoover Wave Length Commission, was the principal speaker of the meeting. In a very concise way, Mr. Cooper outlined the work of the recent Commission meeting held in Washington. Mr. Cooper praised the fine spirit of cooperation shown by all those present, especially by the government broadcasting officials, who agreed to broadcast on lower wave lengths. Two hundred to six hundred meters being the common wave length of broadcast reception from now on, the task of the manufacturer will be a great deal easier. Mr. Cooper also read the new allocations of wave lengths for broadcasters in the New York or Second District of the Department of Commerce.

In discussing the difficulties of the broadcasters with authors', publishers' and other associations that insist on royalties from broadcasting certain matter, Mr. Cooper voiced the opinion that the broadcasters may be forced into an association either to fight such antagonism or to publish their own songs and the like.

Selling radio in the home was the theme of the sales talk given by Mr. H. C. Gawler of the Radio Corporation of America. Mr. Gawler showed that the same methods that have sold phonographs and vacuum cleaners will sell radio sets. He emphasized the fact that the woman is the one who must be sold if the dealer wants to sell apparatus into the home.

Mr. W. H. Harkness, of the American Telephone & Telegraph Company, New York, told of the work of his broadcasting station, WEAF. Mr. Harkness said that the endeavor of his station was through research and constant study to give those programs that the people actually wanted. To do that, his company maintains a broadcasting staff of approximately fifty people. The operating staff consists of twenty, the remainder of the organization being occupied in the work of studying the matter that was broadcast.

Mr. D. W. May, of Newark, N. J., Station WBS, discussed some of the difficulties that his firm had become involved in with the authors' and publishers' leagues.

The vital subject of price cutting was taken up by Lawrence A. Nixon of the Radio Dealer, when as secretary of the Radio Trade Association he spoke of work of that association. It was at the suggestion of Mr. Nixon that the joint meeting was called. Mr. Nixon praised the work of the trade association that has just been formed in New York to combat the evil of selling goods on a cut price basis.

The subject of price cutting occupied most of the attention in the informal discussion that followed the main addresses.

Among those present were: Mr. Bryant of the Chicago office of L. S. Brach Company; Mr. Morton of Clapp-Eastham; Mr. Salzman of the Wholesale Radio Equipment Company, Newark, N. J.; Mr. Lynch of Radio Broadcast, and Mr. Friedman of Radio World.

New Wave Lengths For Second District

At a meeting of the broadcasters of the New York (Second) District with Radio Inspector Batcheller on April 24, the following wave lengths were assigned, to go into effect May 15, 1923:

Meters	Call	Station
233	*	Radio Shop of Newark, Newark, N. J.
244	WBAN	Wireless Phone Corp. of Paterson, Paterson, N. J.
263	WSAP	Seventh Day Adventist Church of N. Y.
	WAAN	I. R. Nelson, Newark, N. J.
273	WRW	Tarrytown Radio Research Laboratory, Tarrytown, N. Y.
	WFAF	H. C. Spratley Radio Co., Poughkeepsie, N.Y.
360	WQAO	Calvary Baptist Church, New York.
	WBS	D. W. May, Newark, N. J.
	WLAW	New York Police Department.
	WHN	Ridgewood Times, Ridgewood, L. I.
	WNJ	Shotten Radio Mfg. Co., Albany, N. Y.
405	WOR	L. Bamberger & Co., Newark, N. J.
	WJY	Radio Corp. of America, Aeolian Hall, N. Y.
	WDT	Ship Owners' Radio Service Co., New York.
455	WJZ	Radio Corp. of America, Aeolian Hall, N. Y.
380	WGY	General Electric Co., Schenectady, N. Y.
	WHAZ	Rensselaer Polytech. Institute, Troy, N. Y.
492	WEAF	Amer. Tel. & Tel. Co., New York.
	WBAY	Western Electric Company.

* Not yet known.

Because it is a duplex station, the new Radio Corporation of America's station on top of Aeolian Hall, New York, was assigned two wave lengths.

(*Concluded from preceding page*)

too much to the strength of the mast to be omitted with safety. The best material for the studding is straight-grained yellow pine, two inches by four inches.

The insert blocks are first nailed in place and then bolted with ⅜-inch carriage bolts. Fourteen of these bolts are needed in all. This is not counting the three bolts at the foot of the mast, which are of ½-inch stock. The other hardware consists of six closed hooks, three of which are fastened to the top of the mast, either as shown in Fig. 3 or as required by the particular make of hook employed. The other three hooks are placed midway down the mast at about the first joint, and three bridles are made with the guy wires as shown. Three strain insulators are placed at the head of these bridles and the main guy wires taken from them. The main guy wires are then anchored to stakes or to weights embedded in the ground, and tautened by means of turnbuckles.

When everything is ready for elevating, lay the mast out on the ground with the yoke fastened loosely to the base by a single bolt. Straighten out the guy wires and leave them in charge of helpers, who spread out and keep the tension even as the mast rises. Two men with forked clothes poles can raise it easily. Have some one ready to put in the two bottom bolts as soon as possible, for when these are in, however loosely they may be inserted, the mast cannot fall. When the guy wires are taut, raise the aerial, and the job is finished.

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Latest Radio Patents

Wireless Telephone Receiving Apparatus

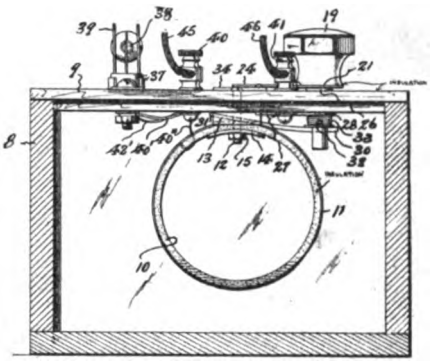
No. 1,448,287: Patented March 13, 1923. Patentee: William F. Gehrig, Newark, N. J.

THIS invention relates, generally, to improvements in wireless telephone apparatus; and, more particularly, to a novel arrangement and mounting of tuning coil and detector devices for wireless telephone receiving sets.

The invention has for its principal object to provide a novel and simple arrangement and mounting of cylindrical tuning coil together with a novel rotary slider switch for cooperation therewith; and the invention has for a further object to provide a neat, simple, cheap and efficient arrangement and mounting of said tuning coil devices together with suitable detector devices for association therewith.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

With the various objects of this invention in view, the same consists, primarily, in the novel tuning coil and detector set for wireless telephone reciving apparatus hereinafter set forth; and, furthermore, the invention consists in the novel arrangements and combinations of the various devices and parts, as well as in the details of the construction thereof.



Sectional view of Gehrig's wireless telephone receiving apparatus.

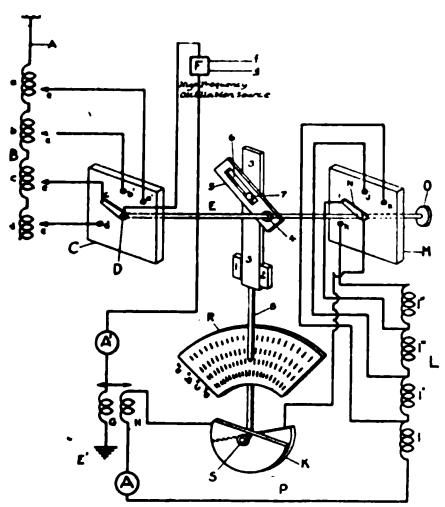
Combined Wave Changer and Wave Meter

No. 1,450,038: Patented March 27, 1923. Patentee, Guy Hill, Washington, D. C.

THIS invention relates to radio signaling apparatus, but more particularly to a wave changer device. The primary object of the invention is to provide operative means in connection with a wave changer for accurately determining the wave length of knowing the wave length transmitted after the set is once tuned and adjusted in case the constants of the antenna are changed; that is, if the set was adjusted to a fixed antenna and this antenna became destroyed, and a new antenna of different constants had to be used, the operator could in no way determine the wave length being transmitted unless he was provided with a wavemeter.

If such a set includes a wavemeter, which is a separate piece of apparatus, such an instrument might easily be removed from the set, and if the transmitting set were on shipboard the wavemeter could easily be left ashore, or in some inaccessible place so that, in case of emergency, the operator might have no method of knowing the wave length he was using.

The present invention overcomes the above difficulties by having a wavemeter built into the transmitting set as a definite part of the transmitting equipment, and, in addition, so mechanically coupled to the transmitter that when the wave length is changed the indicating pointer of the wavemeter is also adjusted to prevent the operator setting his wave-changing switch on one wave length and his wavemeter indicating pointer on the wrong scale, and thereby cause confusion.



Hill's combined wave changer and wave meter.

using a wavemeter having several scales, which are attached to the movable plates of a variable condenser.

The invention involves a method of having the indicating pointer of the wavemeter, which indicates the wave length on the various scales, so combined with the wave changer that, as the handle of the wave changer is operated, the pointer for the wavemeter is operated and picks out or selects the proper scale.

In radio transmitting sets, such as arc sets, where coupled circuits are not employed, impact sets, and certain forms of audion sets, where the radiated wave length depends upon the constants of the antenna circuit and not upon the constants of the primary circuit, the operator has no method

System of Telephony

No. 1,449,372: Patented March 27, 1923. Patentee: Harold D. Arnold, East Orange, N. J.

THIS invention relates to a method of, and apparatus for signaling by means of modulated high frequency waves or currents.

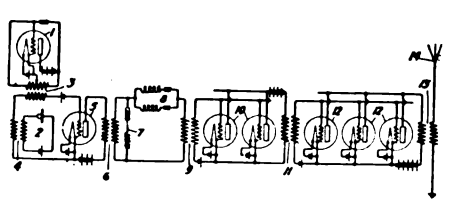


Diagram of Arnold's system of telephony.

More specifically its object is to increase the efficiency of telephonic communication by modulating a high frequency oscillation and eliminating from the antenna, or other sending circuit, constant amplitude oscillations of the carrier-wave frequency, which, in present practice, are impressed upon it. Further objects are to improve the quality of speech received and to make possible the secret transmission and reception of messages.

These objects are accomplished by providing an arrangement of circuits whereby current is suitably modulated and is supplied to the antenna only when the characteristics of the high frequency current to be impressed on the antenna are changing in accordance with the wave form of the signal to be transmitted, and by providing at the receiving station a small auxiliary generator which shall furnish a wave of the frequency of the unmodulated carrier wave.

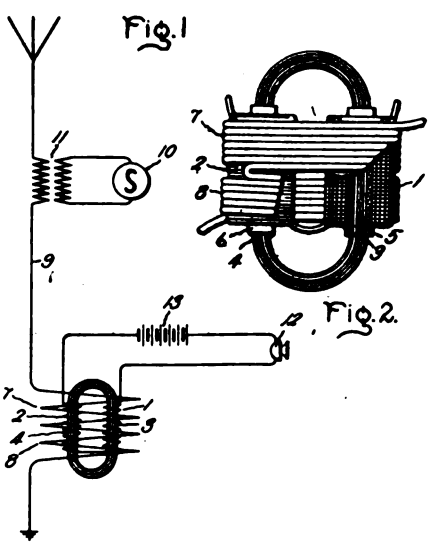
Heretofore in high frequency carrier wave telephony it has been customary to employ a generator of unmodulated or carrier high frequency oscillations, which oscillations are modulated in amplitude in accordance with the low frequency signals to be sent, and are then radiated. At the receiving station, detecting devices are used to respond to low frequency modulations only.

Modulator

No. 1,449,871: Patented March 27, 1923. Patentee: John B. Pratt, Schenectady, N. Y.

MY present invention relates to modulators of high frequency current, and more particularly to modulators of the type commonly known as magnetic amplifiers.

Devices of this general type as used in the past, described for example in U. S. patent to Alexanderson 1,206,643, have ordinarily been constructed with the closed magnetic core made up of thin laminations. They have been constructed either by first assembling the laminations of the core and then winding



Details of Pratt's modulator of high frequency currents.

the coils on this core by threading the conductor through the opening or by first winding the coils and then assembling the laminations making up the core. This latter method requires that the laminations instead of being continuous must be cut in order to permit them to be inserted within the coils.

The object of my invention is to provide an improved method of constructing the magnetic core of such a device which will be simpler than previous methods and result in an improved product. In carrying my invention into effect I first wind the coils which are to surround the closed magnetic core and then form the core by threading a thin ribbon of magnetic material through the coils making enough turns in this ribbon to provide the desired cross sectional area of the core.

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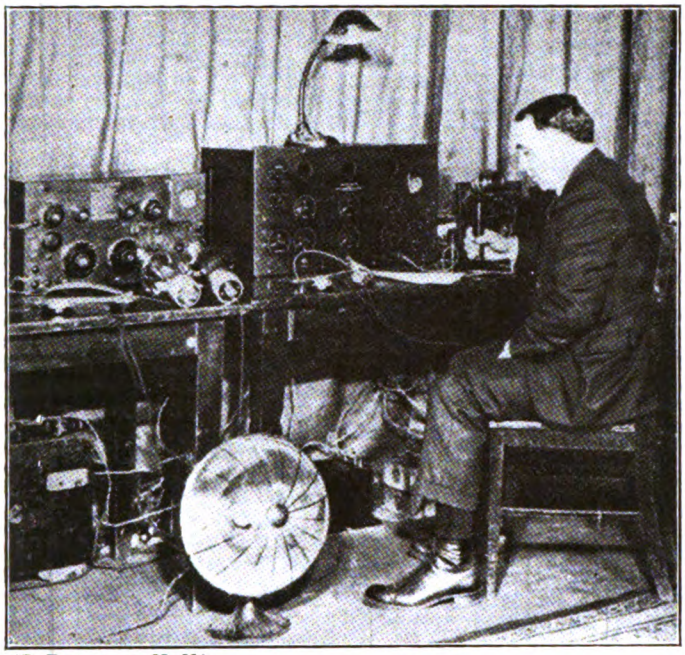
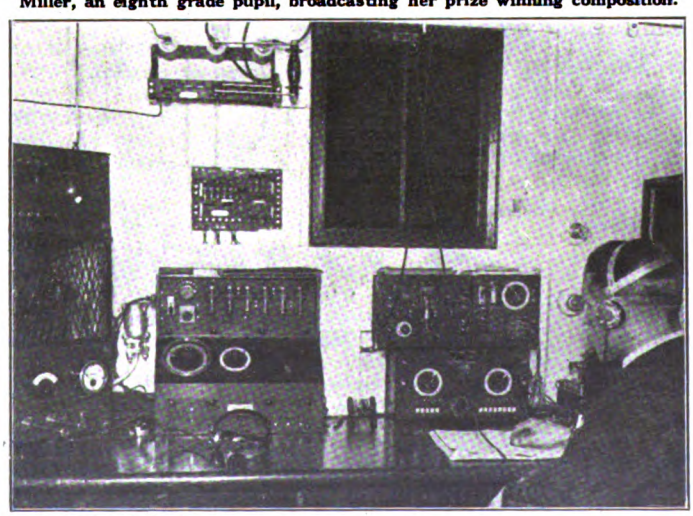
All Important Radio Events Snapped By

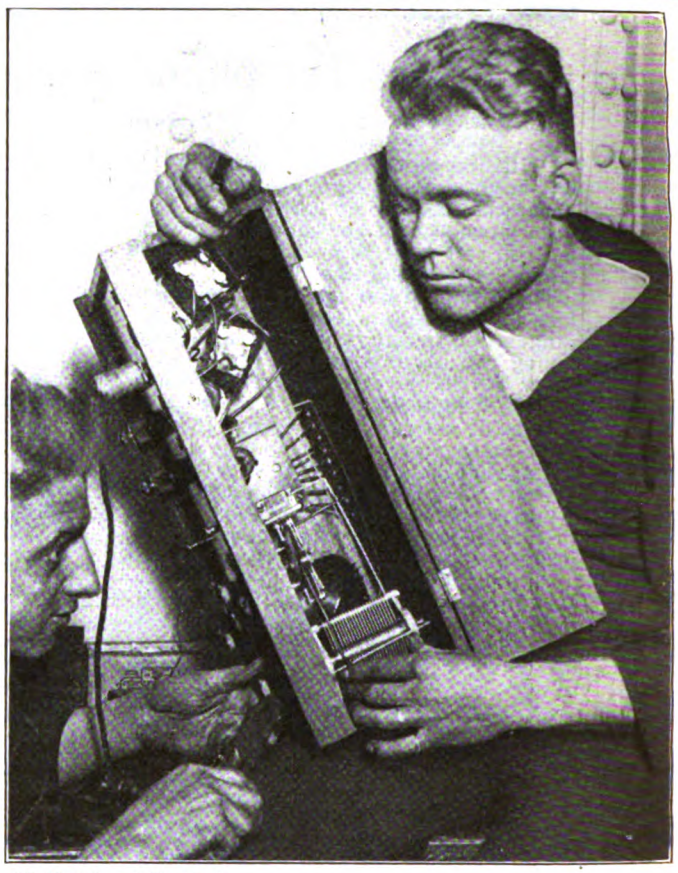


(C. Fotograms, N. Y.)
During these days of uncertain weather, when you can't tell whether the next minute is going to be cold and your bunions are paining so steadily that you can't rely on them for a barometer, the farmers are very grateful to the report service as broadcast from the market centers of the country. The above photo shows the broadcasting station at Roselle, N. J., where they send out the latest market reports on all produce and thereby keep the man on the farm "in the know."

(C. Kadel and Herbert)
A new feature that has created much interest among public school pupils and teachers is the broadcasting through their local stations. Station WHN, of Ridgewood, L. I., was the first to inaugurate this method of procedure. The pupils all compete in composition to get the opportunity of broadcasting their work through this station. The photo shows Violet Miller, an eighth grade pupil, broadcasting her prize winning composition.



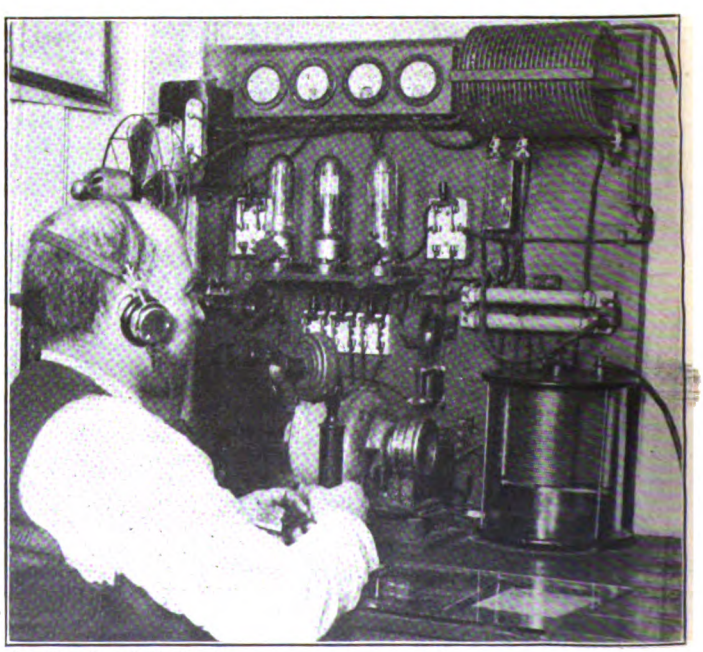
(C. Kadel and Herbert)
The radio room of the S. S. "Belgenland," the newest Red Star liner. This ship is fully equipped with high-speed transmitters and receivers which enable it to handle messages five to eight times as fast as manually.



(C. Kadel and Herbert)

Unofficial Radio in the Navy

Every one knows that the United States Navy is equipped with the most modern and powerful radio apparatus in the naval world. Nowadays they even control battleships by means of radio, fire explosives, and operate hidden mines. Because of that fact few people realize that there are many hundreds of radio fans aboard Uncle



(C. Kadel and Herbert)
150-watt transmitter of Frank Frimerman which has been heard in Honolulu and by ships in the Atlantic at the same time. The set uses three 50-watt tubes on either phone or CW. They are shown in the center of the board right below the four meters. The motor-driven chopper, used when uninterrupted CW is desired, can be seen directly next to the condenser on the right.

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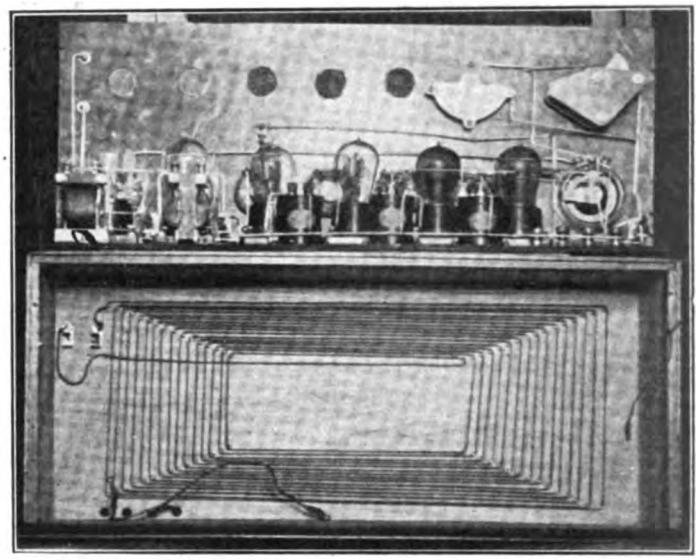
...ed By Our Vigilant Photographers

(C. Kadel and Herbert)

Sam's big boats, but merely consider the naval radio as something to occasionally listen to, and copy if they can.

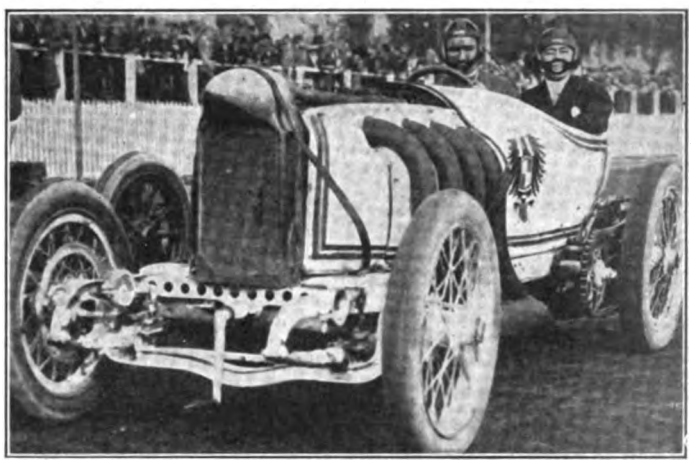
The illustrations herewith show what a hold radio has on the men in the navy. The illustration to the left shows Seamen Mummee and June with their three-tube set, which received WJZ in the Canal Zone, using the auxiliary antenna of the ship. The smaller picture above shows Lt. Commander Vanauken with his set consisting of one step of radio frequency detector and two of audio-frequency. The transformers for this set were made by the constructor and are of the air core type. They can be seen directly in front of the set.

Even though there are many constructors on board the ship, it is not always easy to get an antenna, because of the fact that Uncle Sam won't let everybody string a lot of wire around the ship, where it may be a nuisance, so therefore the boys are called upon to exercise a little bit of ingenuity in the matter of antennae.



(C. Kadel and Herbert)

Compact and self-contained receiver designed by Rutledge Mayo, of New York City. It uses three stages of radio frequency (the first three tubes counting from the right), detector, and two stages of audio-frequency. The loop is contained as shown in the cover of the cabinet. The set can be operated by simply turning on the tubes and swinging the cabinet in the direction of the desired station and tuning with the two condensers shown on the upper right hand corner. The condenser on the left is a three plate vernier, necessary to fine tuning. A 1,500-mile radius is claimed for this set, using the loop and a loud speaker.



(C. Kadel and Herbert)

Equipping fast racing autos with radiophone is the latest wrinkle developed in the radio field, utilizing the invention of Bernays Johnson which was described in RADIO WORLD some time ago. The photo shows one of the "rip-snorters" equipped with the apparatus, just after a race, in which all the sensations of riding at a mile a minute clip were faithfully reported by the man seated next to the driver. The transmitter and receivers are concealed in the helmet, and the apparatus, needing neither high voltage batteries nor generators, and the transmitter taking but very small space without the necessity of using an antenna and ground.

(C. P. and A. Photos)

The latest wrinkle for keeping the busy children of busy mothers busy while busy mother is busying around the house after daddy goes to work. It entirely supplants the rattle and rubber doll. The only precaution necessary is to see that Imogene does not get busy and chew a few yards of insulation off the wire, which is not according to the strict diet rules of the younger class.

(C. International Newsreel)

As a means of keeping the poor movie director from yelling himself hoarse when directing big scenes, they are installing loud speakers with the regulation power amplifying and speech amplifying panels and microphones. The director, instead of using a megaphone, can now speak gently into the microphone, and the actors will hear him as though through the ears of a thousand amplifiers.

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Answers to Readers of Radio World

Kindly inform me where I can obtain a circuit of a two-tube reflex set using a crystal detector and a three-tube reflex set using a tube detector, with antenna and ground, and also loop. Can a loop be used at the same time as the outdoor antenna? Which is better, the crystal detector or the tube detector in reflex circuits? Should I use the same type R. F. transformers in both stages, or are different ratios necessary?—L. M. Rickersond, Laraby Place, Baltimore, Md.

If you will refer to the March 3 issue of RADIO WORLD, you will find the desired information and hook-ups on page 4, under the heading "Multi-tube Reflex Circuits," by W. S. Thompson. Fig. 1 is a diagram using two tubes with a crystal detector, and Fig. 2 is a diagram of a reflex circuit using three tubes. With these circuits you can use either antenna and ground with a tuner, or a loop. If you use the antenna and ground it is connected across the first variable condenser in place of the loop. A loop should not be used when an antenna and ground with a tuner is used. For extra volume, we suggest that when using a loop, you connect a lead from the ground to one side of the loop at the point where it connects to the variable condenser. The advantage of using a crystal detector in a reflex set is its extreme clearness and quietness of operation. The crystal detector is the most perfect rectifier of radio signals, as concerns original tone and clearness. It is a slight but less sensitive than the tube and for that reason many people prefer the tube detector, but at the same time the difference in volume is so slight that it is better to use the crystal in view of the extreme faithfulness of reproduction. Unless you intend using tuner radio-frequency, it is not essential to use different ratio transformers.

* * *

In connection with the article on the "Universal All Wave Receiver," described by F. J. Rumford in the April 7th issue of RADIO WORLD, *is it possible to use the new U. V. 201A tube, instead of the WD-11? Would I have to make any changes in the original wiring? What does the U. V. 201A cost? In using the tuner for a detector what plate voltage would be necessary, and also what is the bias voltage in the grid lead circuit?—Raymond Dabney, Harber, Texas.*

The tube you mention can be used in this circuit, with no changes other than using the regular socket instead of the WD-11 socket. This tube sells at $6.50 list. You should use 22½ volts on the plate for a detector, and 45-60 volts for an amplifier. There is no bias battery necessary—use a grid leak and condenser, as shown.

* * *

In the article published in RADIO WORLD *for January 20, 1923, by Ortherus Gordon it states that a brass rod must be used as the standard of the tickler coil. I am unable to obtain a brass rod. Will an iron rod do? —Theodore F. Fehlandt, 917 Watson Street, Ripon, Wis.*

If you cannot obtain a brass rod use a wooden or copper rod. Iron has a peculiar effect on radio signals when used in or around an inductive circuit, due to hysteresis' which would cause you to lose some of the signal strength.

* * *

I have constructed the set described by Mr. Shults in a recent issue of RADIO WORLD, *but, being within 10 miles of WBZ, cannot tune him out and get other stations with success. He operates on 422 meters. What do you advise?—M. L. Cramer, 46 Cleveland Street, Holyoke, Mass.*

We advise the use of a filter circuit embodying a honeycomb coil and .0005 condenser in parallel in the antenna circuit. Such a filter was described in RADIO WORLD for January 27, 1923, by F. J. Rumford.

* * *

I constructed the set described in RADIO WORLD *for March 10, on page 19. I note that the grid connects indirectly through the tuner to the positive A battery. The set will not function. Is this the trouble? Should it not connect to the minus?—Frank Haas, 120 East Iowa Street, Evansville, Ind.*

You are correct. The grid return should be negative, and connect to the minus side of the circuit you mention. A potentiometer would be of use in this circuit.

* * *

In your diagram of the set described in RADIO WORLD *for January 20 by Ortherus Gordon it states that the top coil (50 turn) goes to the plate and phone. Is this right, or should the 50 turn be the bottom coil?—Roland C. Hetherington, 404 Portage Avenue, Sault Ste. Marie, Mich.*

The 50-turn coil in this circuit is the primary or bottom coil, and the larger 75-turn coil is the tickler, and goes to the plate and phones.

* * *

In RADIO WORLD *for March 3, 1923, you published an article by C. White. Should the condenser C-1 be 13 plate or 43 plate? Should the "B" battery be 22½ or 45 volts? How is the copper shielding grounded?—G. D. Greneman, General Delivery, West End Station, Colorado Springs, Colo.*

This condenser should be 13 plate, as a 43 plate would have too much capacity and the tuning would be too fine. Only a very small variations of capacity are necessary to obtain regeneration and fine tuning.

The "B" battery should be 22½ volts, although using 45 would not hurt the tube, outside of making it harder to control the oscillations.

Shield the copper foil on either the ground post or the negative side of the "A" battery by means of a strip of the same foil that you are using.

* * *

In RADIO WORLD *for February 17, 1923, you published an article by M. C. Batsel on Radio-Frequency vs. Audio-Frequency. In his eighth paragraph he states that the simplest form of radio frequency without the use of addition tubes is the Armstrong regenerative. I have never seen the particular diagram referred to before, although I understand that Armstrong has several circuits. Is this particular one the super?—A. H. Cosman, 728 Royal Ave., New Westminster, B. C., Canada.*

The circuit referred to is the three circuit regenerative, utilizing a variocoupler and two variometers. Numerous hook-ups of this particular circuit have appeared in past issues of RADIO WORLD.

* * *

I am considering building the set described by C. White in the March 3, 1923, issue of RADIO WORLD. *He states that you must use a variocoupler, but does not state the size of the wire that is to be used. Will you please advise me what size wire to use, and also how to wind it?—Wm. F. Grimes, East Gloucester, Mass.*

We refer you to the Anniversary Number of RADIO WORLD, March 31, 1923, where you will find a descriptive article by Arthur S. Gordon on how to make a variocoupler, under the heading of "The Ultimate Coupler —How to Make It," on page 12. It is completely descriptive, giving all the details. This will help you out.

* * *

I am constructing the set described by Mr. Shidler in RADIO WORLD *for March 10, on page 20. He mentions the fact that the tickler coil has 50 turns of wire. Where is this coil, and where does it go? Also what is the dial above the vernier, in the center of the top row on the panel layout?—Michael Shapiro, 2834 W. 30th Street, Coney Island, New York.*

When he used the words tickler coil, he was referring to the rotor of the coupler which is used as a tickler in this particular single-circuit set. As can be seen it connects with the plate and phones, to effect feed back for regeneration. The bulb socket is located in the space you mention and he has drawn the tube in this manner with the rheostat on one side and the primary variations on the other.

* * *

We have a six-tube receiver using a loop three feet square of nine turns of No. 18 lamp cord, each turn three-eighths inches apart. Would a series condenser in one side of the loop make it more selective? We have a one-wire antenna 125 feet long, 50 feet high at one end and have tried to work it with a variocoupler, but have obtained poor results. What can be the trouble?—S. C. Olson, Pablo, Montana.

You do not state what type of receiver you are using, but from the fact that you mention six tubes, we surmise that radio-frequency is used. You should be able to get great selectivity with a loop, and it is not necessary to put the loop in series with a condenser as it will not work properly. The correct method is to shunt the loop with the condenser. Try using a flat loop, winding the wire in a square spiral instead of a solenoid. Better selectivity can sometimes be had by doing so. The set should function properly if connected to antenna and ground by a variocoupler. The secondary should connect across the terminals of the variable condenser that originally shunts the loop. More volume can be had when using a loop if a tap is taken off one of the connections of the loop and connected to the ground.

* * *

In the March 24 issue of RADIO WORLD *you published an article by C. White on the subject of combining radio-frequency and regeneration. What should be the range of such an outfit? At present I have a three-step radio-frequency detector and two steps of audiofrequency, working on a loop. Would the set described give any better reception, as concerns clearness and distance? —E. W. Moreau, 668 Meadowbrook Ave., Detroit, Mich.*

There can be no definite range set for any receiver, as there are too many conditions upon which good reception depends to actually state the range for any receiver. You ought not to have trouble getting 1,500-2,000 miles easily when you learn how to operate it properly. This distance is of course approximate and you may do much better than this, but a conservative estimate is always best when considering receivers in terms of miles.

You ought to get better results as to distance with this receiver than with your loop receiver, because an outside antenna will increase the distance. The advantage of a loop receiver is its extreme selectivity and quiet operation when hooked-up to a good circuit.

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A MAGNAVOX
Power Amplifier
for your
Magnavox Reproducer

MAGNAVOX products are made for people who judge Radio equipment as expertly as the engineer judges a locomotive or a musician a violin.

To answer such requirements, the Magnavox Power Amplifier was developed for use with the Magnavox Radio, the Reproducer Supreme.

Under present conditions, the combination of Magnavox Reproducer and Power Amplifier represents the last refinement in Radio reception — a demonstration at your dealer's is the convincing proof.

R2-18 Magnavox Radio
(With 18-inch horn)

This instrument is intended for those who wish the utmost in amplifying power; for clubs, hotels, dance halls, large audiences, etc. It requires only .6 of an ampere for the field.
Price $60.00

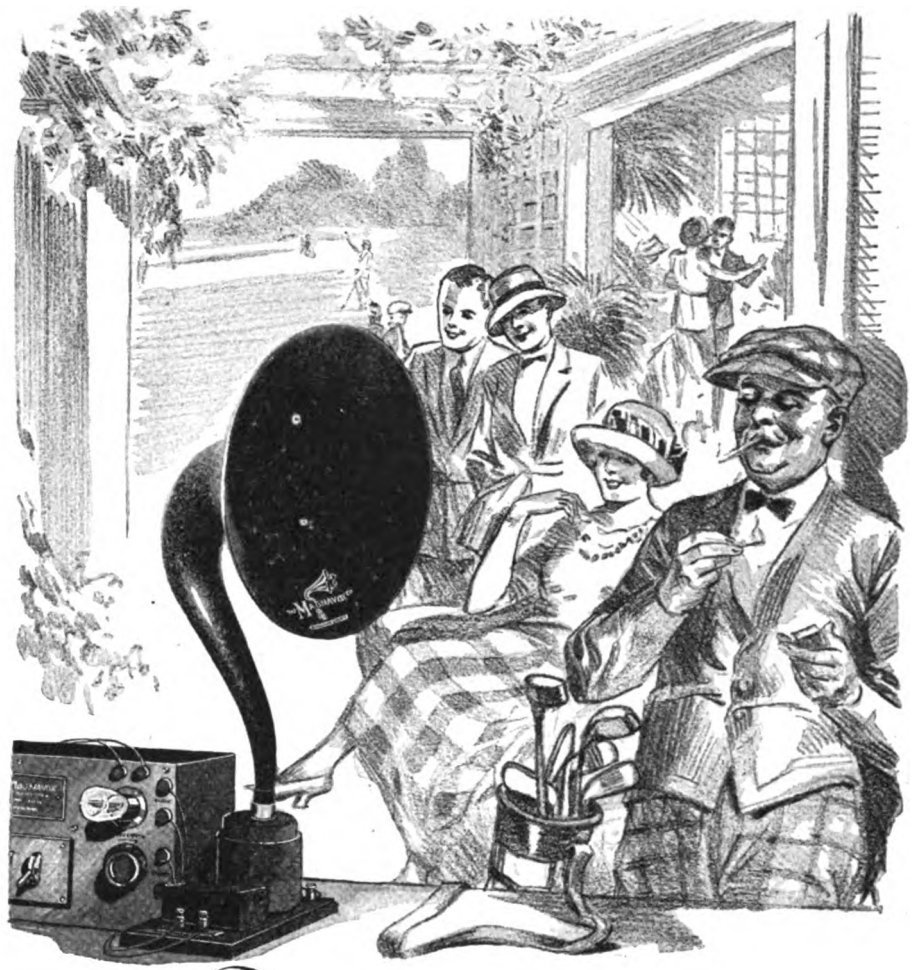
R3-14 Magnavox Radio
(With 14-inch horn)
As illustrated

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R-2.
Price $35.00

AC Magnavox Power Amplifier
As illustrated

For use with the Magnavox Radio and insures getting the largest possible power input.
2-stage, $55.00
3-stage, $75.00

Magnavox Reproducers and Power Amplifiers can be used with any receiving set of good quality. Without Magnavox, no receiving set is complete.



On the Veranda *of the* Country Club

WHERE Radio apparatus, like a professional entertainer, must meet the test of satisfying really discriminating people, Magnavox is certain to be installed.

The first requisites — tone clearness, pitch and quality—are fulfilled by the Magnavox Reproducer; the addition of a Magnavox Power Amplifier supplies the other requisite, volume.

Magnavox Products can be had from good dealers everywhere. Our interesting new booklet will be sent on request.

The Magnavox Co., Oakland, California
New York: 370 Seventh Avenue

MAGNAVOX Radio
The Reproducer Supreme

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Some DX Records to Shoot At

Another Miller Circuit Booster

From D. Alexander, 607 Hastings Street West, Vancouver, B. C.

AS requested by you in RADIO WORLD for October 21 in connection with the Miller circuit, wish to advise that I have been operating such a set for the past month, built according to your diagram with the exception of two minor changes. Instead of using a 50-turn honeycomb coil I find that, with an aerial of 150 feet, it is necessary to use a 75-turn coil for the 360-meter stations, and, for sharper tuning, a coil of 100 turns brings in the 400-meter stations better. I also have eliminated the grid leak.

To say that this hook-up is good would be putting it mild. I have been getting remarkable results with it, and it is by far the best I have tried in my two years of experimenting with different circuits. The signals come in with great volume, and the tuning is very simple. To give you an idea of what I have accomplished I am attaching a list of stations tuned in from February 13 to March 16. Most of these stations are received every night in the week if desired. For Madison, Chicago and Indianapolis I used one stage of amplification after tuning in, all of the others being received on detector tube alone. The mileage shown is via direct air line measured from a radio map. I have received as many as 18 stations in one evening.

For local stations the signals are so strong that I find it necessary to use only one stage of amplification to operate my Magnavox at sufficient volume to be clearly heard all over a large sized room. For distant stations two steps are necessary.

At times I use a UV-200 detector tube, but for best results a VT-1 is used. My aerial is a single-wire, L-type, 150 feet long and about 30 feet high. I find that by using a variable B battery, with switch for changing voltage, much better control is obtained. Within a space of four degrees on the condenser dial I have tuned in as many as six stations by simply turning the dial half a degree, decreasing or increasing the filament, and decreasing or increasing the plate voltage. I would strongly recommend any one trying out this circuit to use a Bradleystat. I tried out all the best known wirewound rheostats, but the Bradley has them all beat for strength of signals and clearness.

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

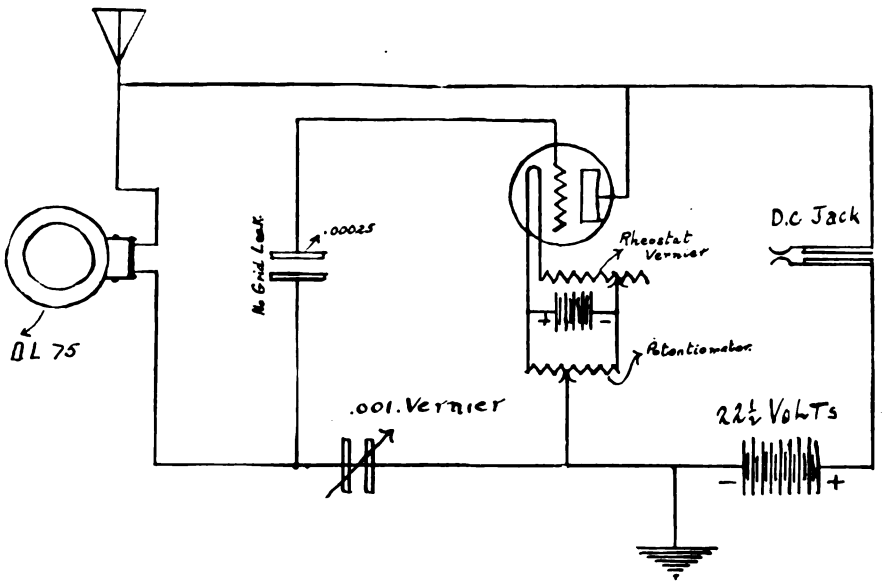
Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

STATIONS HEARD

February 13 to March 16, 1923.

Call Letters	Location	Distance (Miles)
CHCA	Victoria, B. C.	70
KMO	Tacoma, Wash.	165
KFV	Yakima, Wash.	230
KGW	Portland, Ore.	280
KGG	Portland, Ore.	280
7XI	Portland, Ore.	280
7XF	Portland, Ore.	280
KFAE	Pullman, Wash.	360
KNT	Aberdeen, Wash.	180
CFCN	Calgary, Alta.	450
CHBC	Calgary, Alta.	450
CFAC	Calgary, Alta.	450
7YL	Boise, Idaho	540
KFAU	Boise, Idaho	540
KDYS	Great Falls, Mont.	600
KFBK	Sacramento, Cal.	780
KFBB	Havre, Mont.	655
KPO	San Francisco, Cal.	835
KFDB	San Francisco, Cal.	835
KUO	San Francisco, Cal.	835
6XB	San Francisco, Cal.	835
KLX	Oakland, Cal.	835
KZN	Salt Lake City, Utah	850
KFI	Los Angeles, Cal.	1,135
KJC	Los Angeles, Cal.	1,135
KHJ	Los Angeles, Cal.	1,135
KWH	Los Angeles, Cal.	1,135
9XM	Madison, Wis.	1,760
KYW	Chicago, Ill.	1,885
WOH	Indianapolis, Ind.	2,010
9BM	Montreal, Que.	2,460



Miller circuit as used by Mr. Alexander, with which he has done some wonderfully fine work. One improvement on the original circuit is the potentiometer in the filament leads which gives greater selectivity and control of the signals.

Come Right In, You Have Plenty of Company

From Felts Cooper, 316 Melba St., Dallas, Tex.

I AM sending you my record of stations I have heard each night on my crystal set. This set consists of a home-made loose coupler, a crystal detector and a pair of Ciessmann 3,000 ohm phones. No condenser of any kind is used in my set. My record is: WHB, WDAF, both in Kansas City; WOC, Davenport, Ia.; WOS, Jefferson City, Mo., and WMC in Ohio. I hear KSD, St. Louis, about three nights each week. I think this is a good record for a crystal set. I am working on a three-tube set and when it is completed I am going to join the DX Nite Owls. There is no powerful tube set near me, and besides I hear these stations every night.

* * *

A Little Bit of Something Else

From C. G. Montgomery, 699½ Park Place Ave., Bradley Beach, N. J.

I READ with interest the article "An Improved Single Circuit for Nite Owls," by F. N. Hollingsworth, in your issue of RADIO WORLD dated March 10. Mr. Hollingsworth talks as if it is good work for a Nite Owl to get Canada, Cuba and Porto Rico using one tube. I get WKAQ, San Juan, P. R., almost every time he is on, and could get PWX, Havana, the same but for local interference.

I received the following on detector only: WHAD, WDAF, WMAQ, WGM, WSAJ, WEAS, KSD, KDKA, WOS, WBT, WBZ, WFI, WGI, WGY, WHB, WHN, WIP, WJZ, WLW, WOC, WOO, WOR, WSB, WWJ, WAAM, WBAM, WCAE, WEAF, WFAS, WHAS, WHAV, WHAZ, CFCA, PWX and WKAQ.

* * *

Eventually, Why Not Now?

From J. J. Chapman, 3129 Holmes Ave., Minneapolis, Minn.

HERE is another record for the DX Nite Owls.

On the night of March 23, 1923, I tuned in 25 stations, with a total mileage of 17,820 miles.

The stations heard during that evening were: KFI, KGW, KSD, KYW, WAAN, WAAW, WBAP, WCX, WCAE, WDAF, WDAP, WDAR, WFAA, WGY, WHAS, WJZ, WMC, WOC, WOS, WSAJ, WSB, WSY, WLAG, BN7, 8XI.

The apparatus that I use consists of a variocoupler and a variable condenser and one tube. The hook-up is somewhat unusual, but is very simple to operate.

The farthest distance I have covered is: PWX, Havana, Cuba; KFI and KHJ, Los Angeles; KGW, Portland; WOR, Newark, and WEAF, New York.

I think that this is quite a good record for one tube.

* * *

Doing DX with a CR8

From Erwin Grau, Chicago, Ill.

I AM a constant reader of RADIO WORLD, and buy it weekly. I have noticed the column devoted to the DX'ers, and am sending in my list, which I would like to have published next week. I use a Grebe CR-8. The following is a list of my local and DX work so far:

DX—WJZ, WOR, WOO, WIAO, WGY, WOS, WSY, WBAP, WPA, WWJ, WCX, WDAF, WSB, WOC, WDAS, WOAN, WEAF, WGI, WGR, WDAK, WAAY, WLAP, WKAD, WWB, WAAK, WBAD, KDKA, KSD, WGAB, KYI, Bakersfield, Cal.; KFAD, Phoenix, Ariz.; KFAY.

Local—WDAP, WPAD, KYW, WMAQ, WWAY, WBU, W[illegible]AF.

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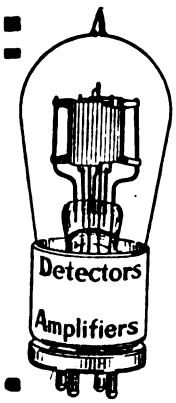
W. T. 501 DETECTOR TUBE

For tube sets, or to convert crystal sets into tube sets at small cost. **$2.00**

Special Socket 40c extra
Special Adapter 75c extra

RADIO RESEARCH GUILD
40 Clinton St. Newark, N. J.



GUARANTEED REPAIRS

Broken and Burned Out

VACUUM TUBES

W.D.-11 not accepted for repair

Your dealer should know, but if he does not, send direct to

HARVARD RADIO LABORATORIES
Boston 9, Mass.

Tubes returned parcel post C. O. D.

"The Little Wonder"

FOR BOYS AND GIRLS

CRYSTAL SETS

Unassembled-Net **$3.50**

Catches distinctly everything broadcasted within 30 miles. We also manufacture the "Little Wonder" assembled set at $5.00.

GUARANTEED
TESTED CRYSTALS

Galena 15c Radiosite 20c

Write for Free Catalog

It lists all our radio parts and supplies.

Holloway Elec. Supply Co., Inc.
238 Third Ave. New York City

Can Wireless Set Off a Blast?

The increasing use of wireless and radio apparatus has led industrial users of explosives to speculate whether the electrical currents released by this might not cause premature explosions when charges are connected up for electrical firing, according to the Explosives Engineer. Obviously, this is a startling line of inquiry, the answer to which will deeply interest all those who engage in electrical blasting.

The matter has been put before the electrical bureau and the radio division of the Bureau of Standards at Washington, and representatives of each expressed the opinion independently that it would be impossible for an electric blasting cap circuit to collect enough energy from a radio station to fire a cap, unless the cap circuit were less than one mile from the radio station. This opinion was based on the assumption that one-quarter of an ampere is a dangerous current.

Four-tenths of an ampere is usually the minimum current that must pass through the bridge wire to fire one cap; but this would be too weak a current to use in series because of the leakage that occurs in most circuits. The manufacturers recommend at least one and one-half amperes to the circuit when caps are connected in series, and three-quarters of an ampere per cap in parallel connection. It would seem, then, that this estimate allows a liberal margin of safety and that blasters need have no fear of radio currents one mile or more from the station. This refers, of course, to high-power stations. The small radiophones used in dwellings need not be considered.

German Radio Patents Confiscated by French

THE Interministerial Committee appointed by Premier Poincaré has decided on the immediate seizure of German inventions patented in France, the most important of which is the Meissner patents on wireless. These patents immediately will be put at the disposal of the French War and Marine departments, according to a press dispatch from Paris. The seizure is held to be justified under Article 306 of the Versailles Treaty, which gives the right "to impose such limitations, conditions or restrictions as are considered necessary for the national defense or public interest." The Meissner patents are considered of the highest importance by the Ministry of Posts and Telegraphs.

Remarkable Regenerative Receivers

Ace Model V
$20
Formerly known as Crosley Model V-t

This one tube receiver is astounding the radio world with its wonderful achievements. Stations more than 1000 miles away are being regularly copied on this set. In comparison to its price, there is no receiver on the market today to equal it in performance.

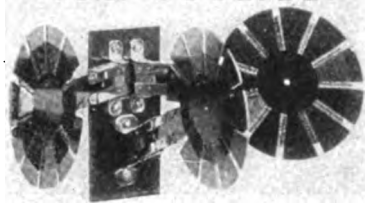
Licensed under Armstrong U. S. Patent No. 1,113,149. The trade name Crosley is used by permission of the Crosley Mfg. Co.

Live Jobbers and Dealers are eagerly taking advantage of the sales this instrument and the rest of the Precision instruments and parts bring them.

Free Catalog on Request.

THE PRECISION EQUIPMENT CO.
Powel Crosley Jr. President
GILBERT AVENUE CINCINNATI, OHIO

THE GOODMAN



PATENT PENDING

The Niftiest Short Wave Tuner on the Market
Only $6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

Subscribe for RADIO WORLD, $6.00 a year, $3.00 six months, $1.50 three months.

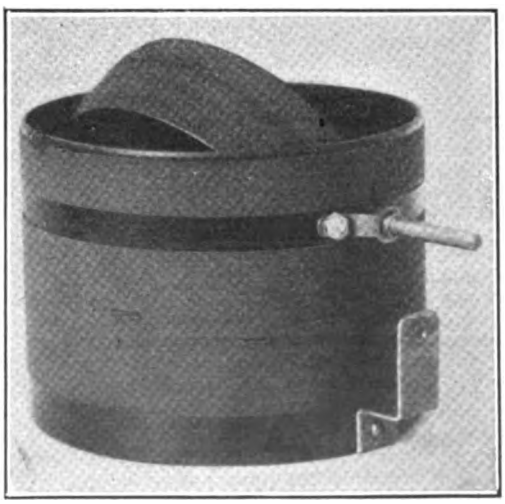
TO GET THAT DISTANT STATION

USE A COAST COUPLER

This coupler is designed along strictly scientific lines, and is the result of eighteen months' experiment. Wound with green silk covered wire on Bakelite tubing. Very selective.

Following are a few of the many DX stations received with this coupler, and detector tube only, at Long Beach, California:

PWX, Havana, Cuba
WWJ, Detroit, Mich.
WSB, Atlanta, Ga.
WDAP, Chicago, Ill.
CFCN, Calgary, Can.
WBAP, Ft. Worth, Texas



Our adaptation of a popular hook-up furnished with coupler. Coupler fully guaranteed when hooked up according to instructions.

Coupler and diagram, sold only under our money back guarantee. Mailed anywhere in the United States upon receipt of $5.00. Post Office or Express money order.

Make All Remittances Payable to

COAST COUPLER COMPANY

321 WEST SEVENTH ST. LONG BEACH, CALIFORNIA

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Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of Radio World, by the following:

Nelson Russell, 135 Glen Ave., Phillipsburg, New Jersey.
William Ruddiman, 292 Berkshire Ave., Bridgeport, Conn.
S. Marchese, P. O. Box 417, Brooklyn, N. Y.
M. H. Kurtz, Elkin's Bakery, 603 East 11th St., N. Y. City.
Clayton J. Taylor, 824 West Seventh St., Chester, Pa.
G. E. Edson, 306 North Willomet Ave., Dallas, Texas.
Toben Brothers, 32 Gilmore St., Whitehall, N. Y. (Dealers.)
Wm. C. Mateer, 872½ West Vernon Ave., Los Angeles, Calif.
Jacob's Cash Store, Sweetwater, Tenn. (Distributors.)
W. Claude Strange, Walnut Springs, Texas. (Wants dealers' prices.)
Edward E. Salley, Woonsocket, Rhode Island.
H. F. Crandall, 128 West 64th St., N. Y. City.
Joseph A. Tagliabue, 1605 John St., Baltimore, Md.
Joseph Weyand, 53 Twenty-seventh St., Guttenberg, N. J.
Golden's Garage, Walnut, Ill. (Retailer.)
Antonio Bosch, San Jose 216, Havana, Cuba.
A. E. McCullough, 649 East Buchtel Ave., Akron, Ohio.
M. A. May, 202 Hubbard St., Yoakum, Texas. (Retailer.)
C. A. Henderson, Belle Fourche, South Dakota. (Interested in amplifying transformers.)
H. J. Linkins, 636 Woodland Ave., Springfield, Ill. (Is an agent selling direct to consumers.)
A. D. Turnbull, 57 Union St., Sydney, Nova Scotia, Canada.
Gale Blaisdell, 427 Eighth St., S. W., Le Mars, Iowa.
A. J. Carlo, Steger, Illinois.
S. S. Stanley, 3206 Champion St., Oakland, Calif.
B. D. Waldron, 724 Union St., Brunswick, Ga. (Dealer.)
William Jordan, Irma Cloak & Suit Co., 242 West 36th St., New York City.
George Campbell, 870 Ashbury St., San Francisco, Calif.
Joe J. Vance, 316 South Bellaire St., Kansas City, Mo.
Walter C. Clark, Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho. (Interested in first class equipment only.)
Maxwell Schmidlapp, Box 735, Taft School, Watertown, Conn. (Will build a receiving set.)
John D. Cushing, Taft School, Watertown, Conn. (Builds and sells sets.)
Tom H. Scholes, 4 Warren St., Lawrence, Mass.
Fred J. Landry, 272 Maple St., Holyoke, Mass. (Will soon open a radio store.)
Forest W. Harshbarger, 29 North Ave., Burlington, Vt.
C. J. McPherson, 4500 Walnut St., Philadelphia, Pa.
"Tex" Lynne, 411 Fannin St., Houston, Texas.
Donald S. Clark, 103 Early St., Morristown, N. J.
Campbell Garage, 602 Avenue A, Palestine, Texas. (Now stocking largest radio store in the city.)
Harry Williamson, Maryville College, Maryville, Tenn.
Harry M. Feintuch, 1495 St. Marks Ave., Brooklyn, N. Y. (Will establish retail radio business at once.)
Erwin Newell, 1827 West 45th Street, Cleveland, Ohio. (Manufacturer's agent. In the market for radio supplies of all kinds.)
E. W. Jobe, 5041 Davison Street, St. Louis, Mo.
W. F. Worrell, Box 52, Bernice, Louisiana.
Chas. Larson, Minneapolis, Kansas.
F. B. Dougherty, 803 Goodrich Avenue, St. Paul, Minn.
Heraldo De Cuba, Radio Department, 32-40 Calle Manrique, Havana, Cuba.

Radiall Moving to Larger Quarters

THE trade is advised that, after May 1, the main office of the Radiall Company, now located at 99 Warren Street, New York City, will be at 654 Grand Avenue, New Haven, Conn. All letters and communications should hereafter be sent to the new address.

The Hartzell Sales Co.

PRESTON M. SMITH, formerly sales manager of the Dubilier Condenser & Radio Corporation, New York City, has been appointed general manager of the Hartzell Sales Company, a manufacturers' sales organization, well and favorably known throughout the eastern and southern states. They represent some of the highest type radio accessory manufacturers, among these being: Alden Mfg. Co., Springfield, Mass.; American Transformer Co., Newark, N. J.; C. Brandes, Inc., New York City; Dubilier Condenser & Radio Corporation, New York City; H. H. Eby Mfg. Co., Philadelphia, Pa.; Electrad Corporation of America, New York City; Mu-Rad Laboratories, Inc., Asbury Park, N. J.; Tait Knob & Dial Co., New York City; The C. D. Tuska Co., Hartford, Conn.; U. S. Tool Co., Newark, N. J.; Witherbee Storage Battery Co., New York City.

The Hartzell Sales Company maintains offices at: 623 Victory Building, Philadelphia, Pa.; 705 Granite Building, Pittsburgh, Pa.; 1028 Fourth Avenue, Huntington, W. Va.; 302 Flatiron Building, Atlanta, Ga. Within a month they will open a fifth office at Dallas, Texas. The territory they cover includes, on the north, New York State (excepting the metropolitan district), west to and including Indiana, and all states south to and including Texas and Oklahoma.

The Hartzell Sales Company has a high-type, clean-cut sales policy, offering the products of the manufacturers they represent to the high-grade, legitimate jobber and manufacturer only, giving such their fullest co-operation.

Radio Stocks

(Quotations as of April 25, 1923, Furnished by Frank T. Stanton & Co., 35 Broad Street, New York, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi Stamped.	5c	15c
Amer. Marconi Unstamped..	$5	$7½
American Tel. & Tel.....	122½	123
Canadian Marconi	2¼	3½
De Forest Radio.....	$7	$10
Dubelier Condenser	12	12¼
English Marconi com.....	11	16
English Marconi pfd.....	11½	16½
Federal Tel., Calif.....	5½	6
General Electric	177¼	177½
Hennessey Rad. Pub. 8% pfd.	9	11
Marconi Int. Marine.....	7	10
Manhattan Elec. Supply.....	55	57
Mackay Companies com....	114	116
Radio Corporation com.....	3⅝	3⅞
Radio Corporation pfd.....	3½	3⅝
Spanish Marconi	1½	2½
Western Union	111½	112
Westinghouse Elec.	57½	57¾

Small But Efficient

The Electric Service Engineering Company, 105 West 47th street, New York City, have called their latest achievement in circuits "The Radio Pup" set. "Pup" is evidently appropriate to the circuit only because of its size and the small number of parts involved; for if the circuit does what its makers claim for it, it is certainly no junior affair.

Coming Event

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

New Radio and Electric Firms

Criterion Radio Corp., New York City, makes radio outfits, $5,000; A. I. and J. Gancher, M. Fleischer. (Attorney, N. M. Hutner, 297 Fourth Avenue.)

Harle Electrical Supply Co., Dover, Del., manufacture, $100,000. (Capital Trust Co. of Delaware.)

Radiotel Manufacturing Corp., Wilmington, Del., electric work, $1,050,000. (Corporation Trust Co. of America.)

Glasen Nature Phone Co., Wilmington, Del., manufacture, $2,000,000. (Corporation Trust Co. of America.)

Sun Electric Corp., Wilmington, Del., agency, $100,000. (Delaware Registration Trust Co.)

Public Service Electric Power Co., Wilmington, Del., build generating stations, $120,000,000, of which 100,000,000 shares without par value or for taxation purposes. (Corporation Service Co.)

Kansas City Electric Supply Co., Wilmington, Del., $150,000. (Corporation Service Co.)

Elgin Electric Corp., New York City, incorporated for $15,000. Directors, L. Weisberg, E. Gettinger; attorney, S. B. Lillienstein, 280 Broadway, New York City.

Paducah Electric Co., operate lighting and power plants, $1,200,000. William T. Crawford, Westwood, Mass.; E. I. Doe, Waltham, Mass.; John T. G. Nichols, Cambridge, Mass.; Theodore T. Whitney, Jr., Milton, Mass. (Corporation Trust Co. of America.)

Williamsburg Radio Supply Co., Brooklyn, N. Y., $10,000; B. Suchar, B. Firstenberg. (Attorney, A. J. Suchar, 801 Flushing Ave., Brooklyn.)

Sterling Electric Co., New York City, $150,000; A. W. Palmer, V. A. Roberts, G. M. Hesller. (Attorneys, Morrell, Bates, Topping & Anderson, 27 Cedar St.)

Chicago Telephone Supply Co., Elkhart, Ind., increase from $150,000 to $300,000.

Deforest Phonofilms, New York City, $50,000; H. Bogdish, A. Powsner, H. A. Deimel. (Attorneys, Fishers & Deimel, 129 West 42d St.)

Brilliant One Radio Products, New York City, $25,000; S. S. Goldstein, G. Mitchell, N. Krauss. (Attorney, S. Rosenberg, 309 Broadway.)

Schachmer Electric Co., Brooklyn, N. Y., $5,000; A. I. Schachmer, A. and B. Kampel. (Attorney, G. Wolf, Astor House Building, New York City.)

Protectophone Corp, New York City, make sanitary mouth piece, $25,000; W. M. Barry, E. H. Faulkner, W. Armstrong. (Attorney, E. A. Eichner, 1545 Broadway.)

Todd Electric Co., New York City, $5,000; A. I. Todd, B. Weiss, I. Katz. (Attorney, I. Silverman, 299 Broadway.)

"1,000 Miles on One Tube"

That's rather a strong statement, but The Radio Parlor, 2671 Broadway, New York City, say that they have the actual proof that their new one-tube set does it. They are merchandising the circuit with a complete list of parts and a simple diagram for the hook-up.

MANUFACTURERS AND DISTRIBUTING AGENTS!

Radio Salesman of wide experience wants popular line of apparatus to sell to radio dealers while on trans-continental tour by auto. Commission basis. References guaranteed satisfactory.

Address MR. ARTHUR G. SHIRT
87 Smith Street Fall River, Mass.

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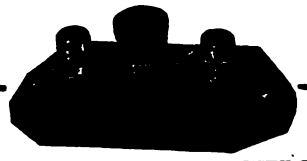
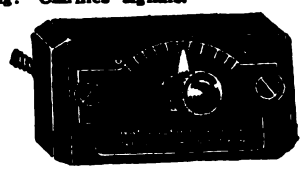


NEW CONSTRUCTION
of all **FRESHMAN**
Variable Resistance Leaks

guarantees long life and permanent resistance—no pencil markings—assures an unbroken range of 180 degrees. Eliminates hissing. Clarifies signals.



A New Leak for
PANEL MOUNTING

Mounted on any panel in a few seconds—2 mounting screws serving as connections behind the panel.

Complete with either .00025 or .0005 mfd. Micon Condenser **$1.00**
Without Condenser **75c.**

A necessary essential for every tube receiving set

At your dealers—otherwise send purchase price and you will be supplied postpaid.

Also ask your dealer for our free diagram of the Kaufman and Flewelling circuits.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 Seventh Avenue New York City
Home of Micon and Antenella

Good Bye Aerials!
So Long Static!

(Pat. Pending)

Replaces aerials, loops, electric light plugs, etc. Eliminates lightning dangers. Reduces STATIC interference and distortion. Brings clearer signals and truer tone. Works on all standard vacuum tube sets.

Postpaid, Anywhere, for $5.00

Satisfaction Guaranteed, or Money Refunded.

Short Cut Radio Corp.
243 West 54th St. New York

Makes Your Set Portable.

Size only 6¼ by 2⅛.

WGY Will Celebrate The Centenary of "Home Sweet Home"

THE centennial of "Home Sweet Home" will be observed by WGY, the Schenectady broadcasting station of the General Electric Company, Tuesday evening, May 8. It is particularly appropriate that WGY should observe the hundredth anniversary of this song because its writer, John Howard Payne, lived for three years in Schenectady as a student at Union College.

He entered Union at the age of thirteen years in 1809 and that year, while homesick and penniless, he wrote a poem which he called "Home Dear Home." The manuscript of this poem is now treasured in the archives of the college. During his third year at Union Payne was obliged to leave college to relieve the financial burdens of his father and at the age of sixteen began a stage career which gave great promise.

Eleven years after he left Union and seventeen years after he had written his poem "Home Dear Home," Payne wrote a second poem on the same theme and called it "Home Sweet Home." This poem was included in a batch of play manuscripts which he sold a London producer for £250. On May 8, 1823 "Home Sweet Home" was sung during the opera "Clari, or Maid of Milan." The opera was a failure, it is unknown today, but the song achieved almost instantaneous popularity. Its popularity was not that of the songs of today for it touched intimately the lives and experience of people of all times and places. Today, one hundred years later, "Home Sweet Home" has lost none of its appeal and that one spark from the genius that was Payne's still glows.

After twenty years' absence from the United States Payne returned and for several years engaged in literary work. In 1842 he was appointed consul at Tunis, was recalled in 1845 and reappointed in 1851. Two years later on April 9 he died in Tunis. Thirty years later the body was brought to America and reinterred in Oak Hill Cemetery, Washington, D. C., with the highest honors.

Dr. Charles Alexander Richmond, president of Union College, will give an address from WGY, May 8, telling the radio audience about the boyhood of Payne. The Union College Glee Club will sing "Home Sweet Home." W. T. Hanson, Jr., author of a book on the early life of Payne and possessor of a large collection of Payne letters and manuscripts, will also deliver an address.

Broadcasted!

IN no less a journal than the London *Spectator* appears the verb "broadcasted." There is no more reason for using "broadcasted" than there is for saying "casted" and "forecasted," contends the Providence, R. I., *Journal*. Long before radio came into existence the verb "to broadcast" was in good and regular standing. Its meaning, of course, was, and still is, "to disseminate widely." We do not say: "He casted a stone at me," or "The weather bureau forecasted a storm yesterday." And there is no justification for tacking on a superfluous "ed" in the case of broadcast.

Something Radio Cannot Raech

Scientists can magnify the human voice 12,000 times, according to the Brockville, Ont., Recorder, but they seem unable to do a darned thing for the voice of conscience.

Ready For You

Now you can sit on summer like a Polar Bear on a cake of ice—No Troubles at all!!

When our investigators first spoke of it we were surprised ourselves, but now we have the actual instruments in stock and ready to ship to the real radio fans who are determined to eliminate summer troubles. You can sit on the verandah this summer and with the NAVY TYPE D TRANSFORMER in your hook-up, hear the best the U. S. A. has in entertainment.

We have enough NAVY TYPE D TRANSFORMERS on hand to fill the first 300 orders. Send at once for yours.

THE RUBICON NAVY TYPE D
(Trade Mark)
Audio Frequency Transformer

Value $5.00—Selling Now at **$4.95**

Pronounced by Eminent Radio Authorities
Most Perfectly Balanced

Here Is a Summary of Their Verdict

NO Magnetic Leakage—NO Distortion—Low Distributed Capacity Permitting Application of Maximum Voltage to Grid of Tube—Scientifically Determined Portion of Iron within Core Delivers Energy Undistorted in Wave Form to the Secondary and Grid of the Amplifying Tube—Necessary for Critical Tubes—Builds Up Weak Signals.

Primary 1100 Ohms. Secondary 5750 Ohms. Ratio 5¼ to 1.

Write out your order and pin a Post Office Money Order to it. Mail to us. Ask for our FREE CATALOGUE. It tells how to get distance by using D X Instruments built for Distance. Send Money Orders; checks and stamps not accepted. Merchandise shipped postpaid east of the Mississippi.

D-X-Radio Co.
123 Liberty St. New York City

Cockaday Circuit

The newest and the most startling development in radio.

Exceedingly Selective. Simple to Operate. Highly Sensitive. Verified C.W. Range of 3200 Miles. Telephone Range of 2400 Miles. Complete Parts for This Circuit.

$12.71

Include the following:

1 Spacial Coil	$3.25
2 Variable Condensers (Bakelite Ends)	3.00
1 Socket (Genuine Condensite)	.50
1 Vernier Rheostat (Cutler-Hammer)	1.50
1 Panel (Genuine Bakelite) 7 x 18	2.50
1 Grid Condenser, Mica Dubilier .00025	.35
1 Switch Lever, 7 Points, 2 Stops	.31
8 Binding Posts	.40
1 Grid Leak (Cartridge Type) and Bakelite Holder	.60
2 Dials, 3 Inch	.50
Total	$12.71
One Stage Amplifying Unit to This Set, Additional	$5.00
Two Stages, Additional	11.00
Cabinets, Piano Mahogany Finish, One Bulb Set	$3.75
Two and Three Bulb Set	4.75

Complete Parts for Flewelling and Reflex Circuits.

U. V. 200 Tubes	$3.95
DeForest DV6A. Wonderful as an amplifying tube	6.00
22½ Volt "B" Battery	.89
Nathaniel Baldwin Type C, Double Phones	8.50
Nathaniel Baldwin Type C, Single Phones	4.50
Brandes (Superior) Phones	5.95
45 V. "B" Batteries (each)	2.25

All orders must be accompanied with a money order, postage included.

GRAND RADIO CO.
1789 Third Ave. 1714 Second Ave.
NEW YORK CITY

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE?

Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want.

ADDRESS SERVICE EDITOR, RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

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ROBBINS
RADIO DESK

An attractive piece of furniture so constructed and designed to meet all the requirements in making a neat installation of the radio in the home. Its many advantages and moderate cost make it almost indispensable.

For Sale By First Class Furniture and Radio Dealers or Write

ROBBINS WOODWORKING CO.
LIBERTYVILLE, ILLINOIS

Radio Bugs and the Radio "Buggy"

By C. W. TUCKER

HEY, look at the crazy guys!" shouted a boy to his playmates across the street as an automobile containing three serious-looking men wearing radio head phones passed through Greenwich Village in New York City. "They got a radio in that car!" But they weren't crazy; not even mildly insane. They were three New York radio engineers—Col. N. H. Slaughter, L. M. Clement and A. S. Santos—returning from an all-night vigil at the radio station at Deal Beach, New Jersey, where they had been "listening-in" on SPE, the International Western Electric Company's radio-broadcasting station at Rio de Janeiro, Brazil, 5,000 miles away. But that isn't the burden of this story. Five thousand miles is not a record for SPE, which has been heard 8,000 miles away, at Honolulu.

Shortly after leaving Deal Beach Mr. Clement, who occupied the rear seat, holding on his lap the seven-tube "baby" which did such good work the night before, became restless, put on a headset and started twisting the knobs and swinging the loop antenna. Soon the strains of an organ floated in on his sensibility, which he knew could be nowhere else but at John Wanamaker's, Philadelphia.

"I got WOO! I got WOO!" What the driver, Col. Slaughter, got was "Whoa! Whoa!" And he brought the car up with a jerk. The other members of the party, when they learned what was going on behind their backs, donned head phones and started merrily on their way.

Rounding a turn in the road Handel's "Largo" on the pipe organ was replaced by "Runnin' Wild," being played by a remarkable jazz organization at WAAM, Newark. This, of course, was caused by a different pointing of the loop. Just then a big truck lumbered by, and the "bing, bang, bang, bing, bang, bang" of the ignition system registered in the ears of the listeners. Every spark was a bang that obliterated broadcasting for the moment.

About two miles ahead, at the top of a hill, could be seen the garage at which it was expected to replenish the gas tank. Just at this time the operator swung the loop around, and WJZ at Newark said: "After the reaction in yesterday's market oils opened strong this morning. South American oils advanced slightly, and Standard advanced a half point." The chauffeur bent over his wheel and stepped on the gas. He must make yonder hill before the price of oil rose. Just then the engine began to miss and sputter. Then she suddenly ceased her circumlocution with a mighty cough. Soundings of the gas tank showed that the slant of the hill was keeping "Maud" from getting the fluid which gave her the kick. Undaunted he turned the car around, backed up the hill, and saved the day.

In Red Bank, New Jersey, a woman stopped spellbound in the middle of the street on seeing the autoists wearing radio ear-muffs. The brakes were applied sharply and the horn gave voice to angry protests against the blockade before she decided to let the "radio buggy" go by. The traffic cop on the next corner paused in wonderment, and said something under his breath before giving the signal to go ahead.

On entering Newark WJZ was transmitting the time signals, and as the radio conveyance passed the Newark market the market quotations were coming in. Apples at four simoleons a barrel; potatoes at 14 kopeks the bag; Bermuda onions at 4,000,000,000 rubles per crate. But time would not permit these radio fans to check up with the retail prices. But here is a hunch for the hurried housewife.

While crossing the meadows the barrenness of the expanse was relieved by the beautiful figures of speech used by Dr. S. Parkes Cadman in his noonday sermon from WEAF. Just as he finished the discourse and uttered the words "Let us pray" a cop rode up alongside of the speeding car, and for the moment the speeders joined in silent supplication. But he passed on, and the trio sighed in relief.

In driving onto the 23d Street ferry boat the once eloquent receiving set was sealed in silence on account of the shielding of the steel frame of the boat. But, by pointing the loop antenna at a steel upright instead of toward the station, the radio travelers were comforted as the vessel embarked on its voyage by "Eternal Father, strong to save, whose arm hath bound the restless wave."

SUNBEAM

The Best Combination, Boys!

SUNBEAM QUALITY goods to complete the Cockaday Circuit
One guaranteed, accurate set of coils consisting of one plain and one Bank-wound coil sent postpaid for $2.75.

17 plate SUNBEAM QUALITY condenser, heavily nickel-plated, handsome finish, all Bakelite Mt's. Adapted for the COCKADAY circuit.....$2.88

PHONES

$12.00 Baldwin, double	$9.80
6.00 Baldwin, single	5.25
8.00 Brandes	5.75
8.00 Federal	4.90
6.00 Murdock No. 56	4.25
7.00 Auth	4.00
RADIOSEAVE LOUD SPEAKER UNIT	3.75
AMPL-TONE PHONES, 2200 Ohms, TESTED AND GUARANTEED	3.75

MISCELLANEOUS

Federal Potentiometer	$1.25
Kiesner Rheostat	.79
Filkostat	1.75
Bradleystat	1.85
Cutler-Hammer Rheostat	.85
Cutler-Hammer Vernier Rheostat	1.25
JEWELL VOLTMETER—zero to 50 volt	3.00
Sterling Voltmeter—zero to 50 volt	2.50
Cutler-Hammer Battery Switch for panel mounting, Nickel Plated	.75

Another hummer. Triple Bank-Wound Coil, Silk Wound. To meet the new Government regulation wave-lengths now being allotted. Furnished with hook-up and instructions.....$3.25

TRANSFORMERS

$7.00 U. V. 712 R. C.	$5.85
7.00 Federal	4.75
5.00 Acme	3.75
5.75 Kardon	3.50

CONDENSERS

Radio Stores Corp., Bakelite Ends, 23 Plate	$3.75
A. B. C., 23 Plate	1.60
Radiant with Geared Vernier:	
23 Plate	5.50
43 Plate	6.00

MIGNON, FORMICA INSERTS

Type A, Plain, 14 Plate	$4.50
Type B, Plain, 26 Plate	5.00
Type C, Plain, 46 Plate	6.00
Type A, Vernier, 14 Plate	6.00
Type B, Vernier, 26 Plate	6.50
Type C, Vernier, 46 Plate	7.50

SOCKETS V. T.

Bestone, Solid Bakelite	$0.75
Eagle, Bakelite	.60
Good Bakelite Sockets	.50
John Firth	.50
Composite Base	.39

DeForest, Eveready and all Radio apparatus of SUNBEAM QUALITY available at Best Prices. Our Radio mechanics will complete any radio set to your specifications.

SUNBEAM ELECTRIC COMPANY
71 THIRD AVENUE (Between 11th and 12th Streets), NEW YORK

Farm Lighting Plants at Bargain Prices. For Yachts, Motor Boats and Country Homes.

ASK ANY "ALL WAVE" COUPLER USER. THEY ALL GET

DX STATIONS LOUD AND CLEAR

WITH THE GENUINE AND GUARANTEED

"ALL-WAVE"
(Trade Mark)
COUPLER

And anyone of the Six Simple Super-Sensitive Single Circuit DX Hookups

GIVEN FREE
with each Genuine and Guaranteed "All-Wave" Coupler

It is an established fact that any one of the simple Capitol Single Circuit hook-ups used in conjunction with the Genuine and GUARANTEED "ALL WAVE" COUPLER will bring in "DX" stations louder and clearer than any double circuit can.

WAVELENGTH
150 to 3000 METERS
PRICE $9.00
effecting a real saving, inasmuch as ALL VARIOMETERS, VARIOCOUPLERS AND LOADING COILS ARE ELIMINATED

Patents Granted

6 efficient hookups sent upon receipt of 10c. to cover cost of mailing

Capitol Phonolier Corporation 60 Lafayette St. New York

Major Mott's Interesting Station on Catalina Island

EDITOR, RADIO WORLD:

Your request of recent date—for a photograph of my Station — has been received —friend.

* * * *

Herewith one that has just been taken, and I append a short description of apparata on the tables. This I would BEG of you to use, as — each time that a foto of the Station has appeared in the various publications—*without* a description —I have been pestered to death by operators from ALL over the country — asking for DESCRIPTIONS!!

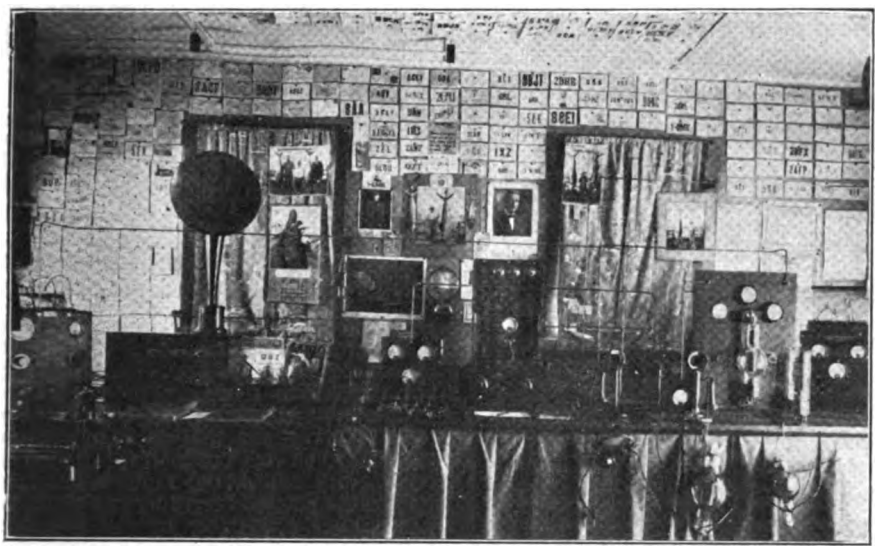
You can save me all this bother by publishing that which I send!

I————THANK————YOU!

Cordially—

LAWRENCE MOTT,
Major—Signal Corps—
O.R.C.—U.S.A.

Avalon,
Catalina Island, Cal.



Station 6XAD-6ZW, Owned and Operated by Major Lawrence Mott, Avalon, Santa Catalina Island, Cal.

DESCRIPTION OF 6XAD-6ZW.
(Owned and Operated by Major Lawrence Mott, Signal Corps, O.R.C., U. S. A.; U. S. Deputy Game Warden.)

Apparatus, from right to left:

1. Combination telephone and telegraph set, using four 50-watt tubes. Power derived from special design m-g set, giving up to 3,000 volts.

2. The big transmitter. So built as to use either a WE-250 (shown at right of panel), a GE-250 (shown in circuit), or either of the two British tubes (Mullard), shown hanging below; one a 500-watt and the other a 250.

3. Special design transfer switch that, by one motion, throws over antenna, counterpoise, ground and power from one to another of the four transmitters, as desired.

4. Antenna switch.

5. Grebe CR-5, with WE design, 2-step amplifier above, and above that a WE-7A amplifier, giving, in tandem, a *wonderful* result.

6. 100-watt transmitter, using two WE-50's on 220 meters, rad. 6.1. On this set, during season '22-'23, I have been reported from Australia, New Zealand, Europe, off the coast of Brazil, in northern Alaska, and from many parts of both the Pacific and Atlantic Oceans. This transmitter has *effectively worked* every district, been heard in every state, and in every Canadian province.

7. Another WE-7A amplifier (in front of magazines). Used in conjunction with new type Grebe CR-7, shown next, with WE Grebe I hear all the larger power stations of the world. POZ is so loud that signals may be read 200 feet from horn.

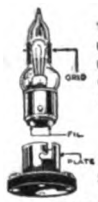
8. Transmitter, using four 5-watt WE tubes, or one 50 watt. Used for work up to 1,000 miles, though effectively used in '21-'22 in working 3ALN, 3FS, 8BUM, 8AWP, etc.

Twenty-six tubes are used in the sets—chiefly WE. Nearly 1,000 cards and a vast number of telegrams, cables and letters have been received in the passed season. All four walls of the operating room are entirely covered with cards. Only a few shown in the photograph. The ceiling is partly covered.

PATENTS
promptly procured. Trade Marks registered.
FREE INVENTION RECORDING BLANK
Phone Vanderbilt 7212

FREE BOOK — MANUFACTURERS PATENT CO., INC. 520 FIFTH AVE NEW YORK

ECONOMY! QUALITY! SERVICE!



The Delta is a 3-volt dry cell tube, using a 22½-volt B Battery.
Can be used as detector in any successful circuit.
Guaranteed 1000 hours' service.

$2.50 Each

Composition Delta Socket, 40c each.
Standard Socket Adapter, 75c each.

DELTA MIDGET TUBE CO.
241 Market St. Newark, N. J.

Selectivity Sensitivity Simplicity

ALDWIN CIRCUIT

Complete Set in Cabinet—Will Operate Loud Speaker

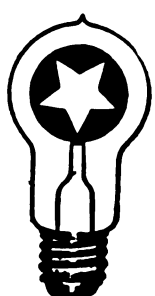
$25.00

Two Stage Amplification with Loud Speaker

$100.00

A. R. J., N. Y. City—"Gets Havana and Atlanta clear as a bell," says he.

ALDWIN RADIO CO.
676 Eighth Ave. New York City
We will ship our sets anywhere in the U. S. and guarantee satisfaction.



Price $1.50

The NEON LIGHTNING ARRESTER

Best Protective Arrester for Aerials on the Market

Helps Eliminate Static

Can also be used as a Rectifier for small currents

Approved by Underwriters' Laboratory
N. Y. Tribune Laboratory

Neon Lamp Works
62 W. 14th St., New York

THE WONDER BOOK OF RADIO

This book, which gives all the latest information in simple language, is endorsed by Radio experts.

THE RADIO CONSTRUCTOR

Volume 1, Number 3

CONTENTS
ONE TUBE REFLEX AMPLIFIER.
REINARTZ TUNER (With Spider Web Coil).
TWO STAGE RADIO FREQUENCY AMPLIFIER.
REGENERATIVE SET (with Two Stage Amplifier for W.D. 11 Tube.)

FULL SIZE PANEL LAYOUTS for Each Set. The template can be placed on the panel and holes drilled where marked, thereby saving TIME AND MONEY.

COMPLETE LIST OF BROADCASTING AND MERCANTILE STATIONS in United States and Canada.

In great demand. Get your copy today. At your DEALER'S or direct by mail. Per copy prepaid..... **50c**

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74 DEY STREET, Dept. G NEW YORK CITY
Send coin or money order—cheques or stamps not accepted

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FOR ONLY $7.00

You get all the parts necessary to build complete

"RADIO PUP SET"

We get favorable comments from all who have built it.

This unique one-tube set is a wonder, most simple in construction—yet gets the distance and has the tone-quality of a three-tube set

We have all the "Hard-to-Get" Radio Supplies at Prices That Are Right.

MAIL ORDERS PROMPTLY FILLED

Electric Service Engineering Co., 105 West 47th Street, New York

Bryant 2743

Mr. York, Scranton, Pa., has had Minneapolis, Minn., and Kansas City, 1,250 miles from Scranton.

1000 Miles Guaranteed on One Tube

*A **real** Radio one tube set for a **real** low price.*

Oak cabinet, two dials, drilled panel, vern. rheostat, vern. button for dial, eight rubber top binding posts, 23 p. A.B.C. condenser, variocoupler, socket, two fixed condensers, busbar and spaghetti. Together with simple diagram. Any boy can hook it up. Price....$14.00

Without cabinet $11.50

The above can be used with any tube having standard base or W.D. 11 and U.V. 199 by using adapters. This set has been and is being used in many of the Eastern States. We can furnish names of owners who have received Havana, Cuba, and Los Angeles from New York, Chicago, Davenport, St. Louis, Kansas City. Atlanta can be tuned in from N. Y. any night.

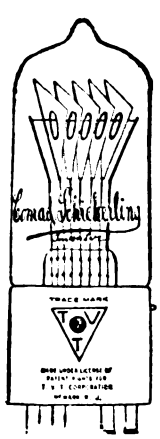
Mr. E., Riverside Drive, N. Y., claims he gets Los Angeles any night after midnight.

Express or P. O. money orders accepted. Set shipped same day order received. Full description given above. At this low price we cannot bother with unnecessary correspondence.

The Radio Parlor, 2671 B'way (Bet. 101st and 102d Sts.), New York

T. V. T. Detector Tubes

BELOW MARKET PRICES



We have just made an exceptionally fortunate purchase of T. V. T. Detector Tubes at much less than regular prices and we offer the public an opportunity to participate in an advantage, which seldom occurs.

The new Triangle Plate Tube is a new invention, making unnecessary the use of grid. It has been thoroughly tested by many of the foremost radio experts and claimed to be far superior to the fragile grid tube in strength, durability and results.

It completely eliminates all the rasping, howling grid noises and distortion caused by the vibration of the grid in all grid tubes.

T. V. T. Tubes are gridless. They are better tubes, scientifically made to reproduce the sound of voice or music free of distortion and harshness, in clear; soft, natural tones.

Every tube thoroughly tested before leaving our firm

6-Volt	**List Price, $5.00**	**Sale Price, $3.50**
2-3-Volt	**List Price, $6.50**	**Sale Price, $4.00**

P. O'BRIEN

310 LERNER BUILDING JERSEY CITY, N. J.

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD 1493 *Broadway, New York City*

Please send me RADIO WORLD for ..... months, for which please find enclosed $.....

SUBSCRIPTION RATES:

Single Copy .....$ .15
Three Months 1.50
Six Months 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year to Foreign Postage; 50c for Canadian Postage.

.....

.....

Radio Forces Cable Rate Reduction

ANNOUNCEMENT was made last week by the French Telegraph Cable Company, New York City, of substantial reductions in cable rates, effective at once to various countries of Europe. An official of the company explained that the reductions were made because of the increasing competition offered by the radio field.

Both the Western Union and the Commercial Cable Company previously had made announcement of the lowering of their rates, and it was explained that the action by the French company was merely to equalize theirs with the others.

Under the new schedule the rate to Great Britain of all three companies is 20 cents instead of 25; France, 22 instead of 25; Switzerland, 27 instead of 30, and Italy, 26 instead of 31.

Survey of Vacuum Tube Supply Is in Progress

ANNOUNCEMENT was made last week that the National Radio Chamber of Commerce, 165 Broadway, New York City, has undertaken a national survey of the vacuum tube supply in the United States.

This survey, the first to be made, and reported to be well under way, "vitally concerns every one in the radio industry, as well as the public," according to a statement issued after a meeting of the Board of Governors, at which numerous groups were represented. The governors, it was stated, acted at the request of the chamber's membership and of other elements in the radio industry.

Specifically, the supply of the following tubes is concerned: 200, 300, 201, 301, 201-A, 301-A, DV-6, DV-6A, WD-11 and WD-12.

This movement, it is asserted, is part of a program to aid in the orderly development of the radio industry in the interest of both the industry and the general public. Co-operation with the Department of Commerce and other government departments, as well as with universities and public and private institutions, is embraced in the plans.

Partial Program of WGI, Medford Hillside, Mass.

360 Meters

Saturday, May 5, 1923

6.00 P. M.—New England Weather Forecast furnished by the U. S. Weather Bureau. Late News Flashes. Early Sports News. Boston American.

6:15 P. M.—Condition of Massachusetts Highways furnished by the Automobile Legal Association.

6:30 P. M.—Boston Police Reports—Boston Police Headquarters. Amrad Bulletin Board.

6:45 P. M.—Code Practice, Lesson Number Forty-Five.

7:00 P. M.—Evening Program.

1. Fifth of a series of talks on New England Problems under direction of the New England Business.
2. "The Thirteenth Chair" presented by the Amrad Players, W. Eugene Hammett, Director.

Sunday, May 6, 1923

4:00 P. M.—Twilight Program.

1. Concert by L. Doersam, Baritone, accompanied by Miss Florence Doersam.
2. "Adventure Hour" conducted by the Youth's Companion.

8:30 P. M.—Federation Church Service conducted by Mass. Federation

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FREE

Phonograph attachment with all orders for $5.00 or more.

1000-Mile Range Guaranteed on This One Tube Set, consisting of the following: Drilled Panel, Variocoupler, Condenser, Rheostat, Socket, Grid Leak and Condenser, 2 Dials, Switch Lever Point Stops, Binding Posts, Bus Wire, Spaghetti, Lugs and Complete Instructions. Can be assembled in half hour. All for the

Special low price, $15.00

Long Range Receivers	$4.50
$5.00 Audio Transformers	2.95
Electric Solder Iron	4.25
$5.00 Variocoupler, 1800	2.25
$5.00 Detector Tube	3.00
$6.50 Amplifier Tube	3.25
3 Plate Vernier Condenser	.45
23 Plate Precision Condenser	1.10

Economy Radio Company

132 Nassau Street New York, N. Y.

Write for price lists

Nova Scotia Radio Station Wanted

APPLICATION to the Canadian Department of Marine, Ottawa, has been made by C. F. Crandall, president of British United Press, on behalf of American Publishers' Committee on Cable and Radio Communications, for a license to erect and operate a wireless station on St. Margaret's Bay, Nova Scotia. For nearly a year an experimental station of moderate power has been operated at Halifax. This service has proved so successful that a larger station is desired.

12000-OHM List Price 75c.

RESISTANCES IN STOCK

For the New Super Circuits

RADIO STORES CORPORATION

DISTRIBUTORS

226 W. 54th St., N. Y. City Longacre 10110-9210

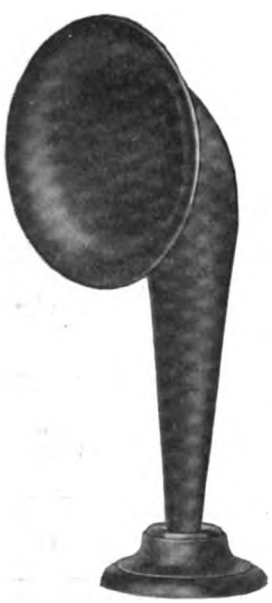
"GRANOLITE"

UNIVERSAL LOUD SPEAKER RADIO HORNS

THE ALL-WOOD, PERFECT REPRODUCING HORN YOU HAVE BEEN LOOKING FOR

They will not warp, crack or peel

"GRANOLITE" Universal Radio Horns are positively superior to all others because we have embodied in their construction perfect acoustic qualities, careful workmanship, high grade, carefully selected materials, strength and beauty of design. The base construction and equipment is universal, permitting the installation and use of any of the standard and well known loudspeakers and receivers.



"Granolite"
Made in three sizes.
No. 1 with - 7½ inch bell; height, 15 inches.
No. 2 with - 9½ inch bell; height, 19 inches.
No. 3 with - 14 inch bell; height, 25 inches.

LIST PRICES

No. 1 Horn, 15" high..... $8.00
No. 2 Horn, 19" high..... $10.00
No. 3 Horn, 25" high..... $12.00

Immediate Delivery Prepaid on Receipt of price. Above prices apply to horn and base only. If horn is wanted complete with receiver add $6.00.

Dealers, write for own special trade proposition.

Granolite Horns Are Manufactured Solely by

Granolite Art Products Co.

222-224 4th STREET MILWAUKEE, WIS.

"Loops is Loops"

MANY radio fans, when a loop is mentioned, always visualize a set operating with six or seven tubes, a loud speaker, and in general about three or four hundred dollars worth of apparatus. That is, of course, if they make their own sets. They do not realize that there are numerous advantages to a loop that can not be obtained by the use of an outside antenna. Of course, it is to be understood that for really long distance work you have to use an outside antenna, unless you incorporate three or four tubes, with radio-frequency, etc. But if you are content with quiet reception, over a medium distance, with freedom from disturbances such as interference and numerous other things, no better antenna could be used than a loop.

It is not necessary even to incorporate multi-tube reflex circuits, but if the apparatus is handy, a one or two-tube reflex, using a crystal detector will work surprisingly well, and will give you the advantage of wonderful selectivity.

Apart from that, the one other big advantage lies in the fact that you will not be bothered so much in your tuning with the tuning proclivities of your neighbors which sometimes amount to bedlam when they all get going at once, trying to get in PWX, while their neighbors are trying to hunt for KFI, and a hundred others.

Try it out on a loop and let the other fellow howl when he is bothered by interfering stations.

Finds RADIO WORLD Newsy, Interesting and Helpful

EDITOR RADIO WORLD: I am a "newsstand subscriber" to your paper and find it very helpful and interesting.

I think RADIO WORLD is about the best of its kind because it comes out every week and has all the latest "dope" on radio.

Yours truly,
FRED GOLDIN.

Bryant Hotel,
San Francisco, Cal.

Who Did This?

EDITOR, RADIO WORLD: I would like to ask, through your columns, if any fan heard a broadcasting at 4:30 to 5 a. m., April 23, as follows: A Duet from "Il Trovatore," Soprano and Tenor; Military Band playing "Stars and Stripes Forever" and "The American Patrol."

Call letters were not given, and seemed to be at a great distance. Who was it?

Woodhaven, N. Y. CONSTANT READER.

NOW IN PREPARATION

Radio World's Special Vacation Number

Advertisers who want to reach proprietors of summer hotels, summer camps, etc., and owners who contemplate equipping their country homes, yachts, motor boats and automobiles with radio sets can reach them quickly and effectively by using space in RADIO WORLD'S SPECIAL VACATION NUMBER.

Our Circulation Department is making special efforts to reach all these potential buyers of your goods, and to see that a copy of THE VACATION NUMBER is placed in their hands so that they cannot fail to read the advertising announcements as well as our text pages.

RADIO WORLD'S VACATION NUMBER will be unusually interesting, be profusely illustrated with outdoor radio pictures, full of the snap and go of outdoor life, and its many special articles and illustrations are designed to make readers want the goods offered by our advertisers.

REGULAR RATES WILL BE IN FORCE AS FOLLOWS:

One page: One time—$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—$5.00. Per agate line—$0.40.
On four consecutive issues—10% discount.
On thirteen consecutive issues—15% discount.
Cover and preferred-position rates made known on application.

Terms: 30 days net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

SELL THEM YOUR GOODS!

Wire, write or phone now about special positions.

RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

VACUUM TUBE RESULTS FROM A CRYSTAL SET! A "PT" Ultra-Sensitive Contact will increase the range and audibility of your crystal set. We guarantee this wonderful Contact to be MORE SENSITIVE THAN ANY OTHER CAT-WHISKER MADE; and that IT WILL NOT JAR OUT. WITH A "PT" MYRLE WOOD HEARD 46 PHONE STATIONS, IN A THOUSAND-MILE RADIUS! Others likewise testify that the "PT" has given results equaling tube equipment. Simple to install in any crystal detector. Price only twenty-five cents coin. "PT" CRYSTAL CONTACT COMPANY, Box 1641, BOSTON.

MOVIE FILMS—For Professional and Toy Machines. Wonderful complete stories with best Movie Stars. SPECIAL BARGAIN—1,000-foot reels, ONLY $3.00. Stock up, BOYS, while they last. Monarch Theatre Supply Co., 724 South Wabash Avenue, Dept. 69, Chicago.

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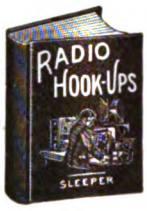

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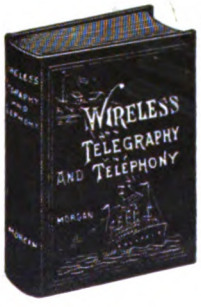

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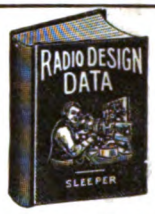

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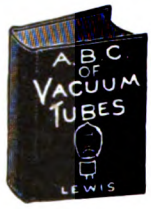

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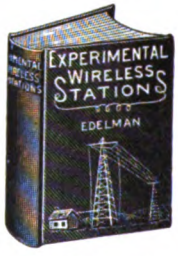

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RADIO WORLD

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ILLUSTRATED EVERY WEEK

How to Construct and Tune a One Bulb Regenerative Set for Long Distance Work

By C. H. Stoup

THE writer, in this article, describes a one-bulb outfit from aerial to ground, on which we hear regularly broadcasting from Havana, Cuba; Denver, Col.; Canadian and California stations from a location near Pittsburgh, Pa. Any set may occasionally hear a long distant station but for regular long distance work this outfit, when correctly assembled, cannot be beaten for efficiency as a one-bulb set.

First, make sure that every part or instrument you purchase is of the very best. It takes high grade parts to get satisfactory results from a radio set. Buy only known apparatus at a reliable electric store which handles a complete line of radio supplies.

Be sure everything is wired correctly by making one connection at a time, then checking with the diagram to see if the connection is exactly right. The accompanying diagram has been checked and rechecked to make sure it is O.K., so follow it in every detail.

Make all the leads as short as possible, particularly the connection between the grid leak condenser and the grid. Solder wherever necessary. Don't run the connection wires of your set parallel. Insulate everything perfectly.

(*Continued on page* 8)

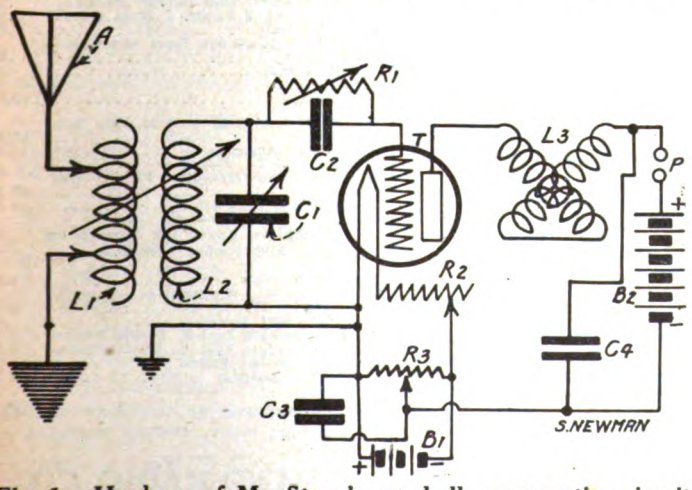

Fig. 1. Hook-up of Mr. Stoup's one bulb regenerative circuit.

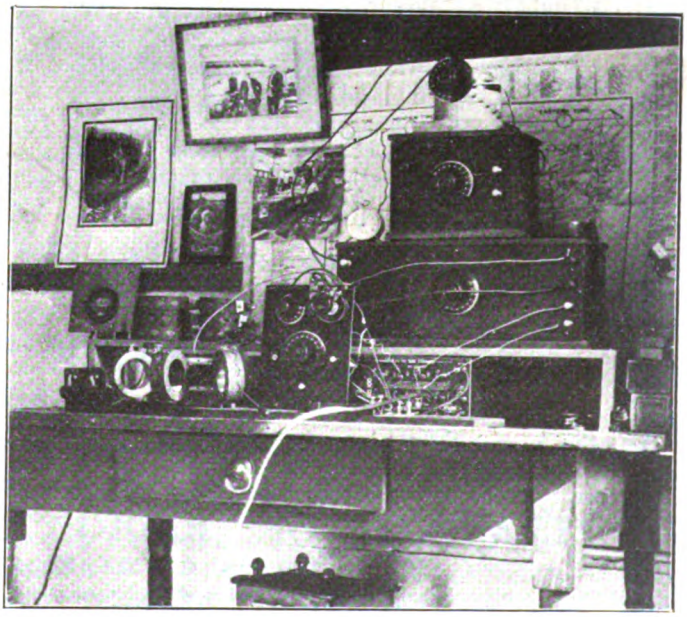

Fig. 2. One bulb regenerative set as built by Mr. Stoup and described herewith.

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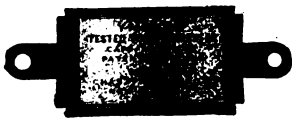

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Artificial Lightning and Thunder Startle Electrical Engineers

FOUR hundred electrical engineers who attended the spring meeting of the American Institute of Electrical Engineers at Pittsburgh last week were startled while visiting the Westinghouse new high-voltage testing laboratory at Trafford when one million volts were shot into two brass spheres placed several feet apart. The unexpected display and its resulting blinding flash, similar to a streak of lightning out of a clear sky, and the crashing, man-made thunder, which could be heard a mile away, nearly knocked several of the engineers off their feet.

A wonderful illuminating effect was next produced by drawing a high-voltage arc over a distance of 25 feet. This demonstration, which lasted for three minutes, lighted up the entire laboratory.

The electrical engineers inspected every phase of the new laboratory and its facilities for testing power apparatus, insulators and line material that will be used on high-voltage hydro-electric transmission lines and also for the fast developing super-power systems that are being contemplated throughout the country.

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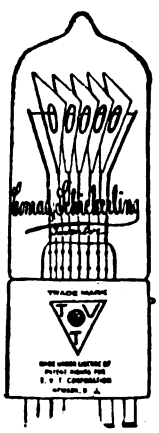

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Total	$12.71

One Stage Amplifying Unit to This Set, Additional	$5.00
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22½ Volt "B" Battery	.89
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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 7. Whole No. 59 May 12, 1923 15c. per copy, $6.00 a year

A Home-Made Radiophone Set of Great Range

By Dr. B. S. Bickelhaupt

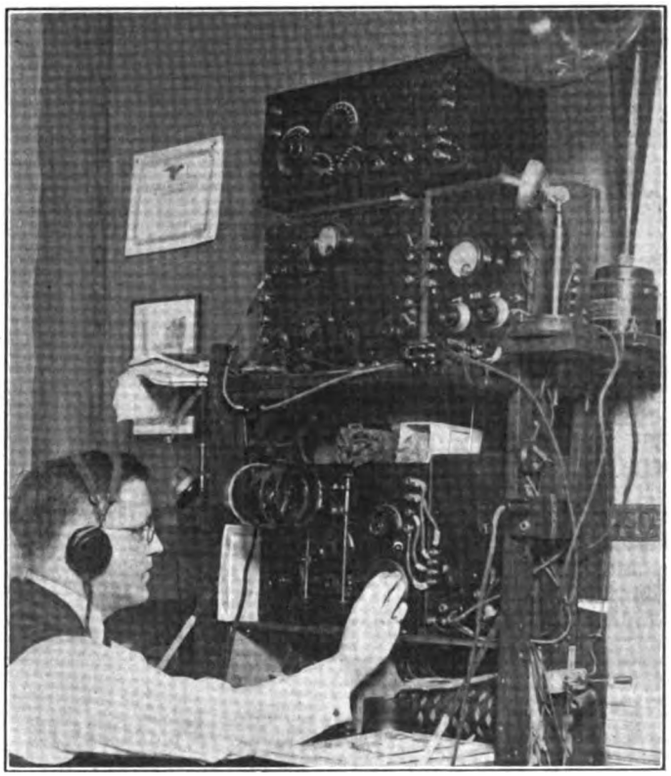
A NEAT and efficient amateur radiophone station is that with the call 2CBA built, owned and operated by Dr. B. S. Bickelhaupt, 376 East 162nd street, New York City. The entire apparatus for both the receiver and transmitter was constructed by the owner, who describes it as follows:

"The receiver shown is not the type that the reader usually runs across, in that it is not of the regular honeycomb type. It is a single layer coil set employing regenerative principles with both inductive and capacity feedback. The method is known to produce the best results. I have been using this for the past two years and have come to regard it as the most reliable outfit any one can handle. Any station broadcasting that is powerful enough to reach me will be heard and the statement is made with that reservation since freak reception of a weak station occurring once in a blue moon should not be accepted as representing the consistent range of a station. I have heard practically all stations within a 1,200 mile radius. Amateurs have been heard from practically every state.

"The transmitter is a tube set employing four 5-watt tubes. With a fairly low plate voltage (350) I have consistently covered a radius of 200 miles even in summer with all the attendant drawbacks. During the winter, of course, the range is materially increased, my station having been heard in Michigan and Missouri which means also the intervening territory as well. The set is tuned to 200 meters but provision has been made to reduce to 178 meters for testing purposes. Occasionally as low as 150 meters has been used, although I have as yet been unable to determine the efficiency of the set at this point.

"The entire outfit has been self-constructed and since I have first made it there have been many changes, with subsequent improvement in the outfit to bring it up to its present standard of efficiency. There is only one contemplated change, and that is the addition of two steps of radio-frequency which may be switched on at will.

"I shall be pleased to advise anyone on the constructional details of any part of my equipment, should they care to write me."



(C. Photonews, N. Y.)
Dr. B. S. Bickelhauft, of New York City, and his long range station 2CBA.

Radio Transmission Records by Cruiser "Omaha"

NAVAL radio experts are delighted with the performance of the radio equipment on the new scout cruiser "Omaha," which recently broke all long distance records in transmitting during her "shakedown" cruise in the Pacific.

While maneuvering at sea off the coast of Washington, the newly installed radio transmitting sets were given a thorough test. Code messages transmitted with the 20 KW arc set such as the larger naval craft are now equipped with, were copied by all naval radio stations along the west coast from lower California to Saint Paul, Alaska, and on the east coast at Bar Harbor Me., Washington D. C., and Key West, Fla. One of the stations reached was San Diego, 1,800 miles away from the "Omaha." This new cruiser's arc was copied by the battleship "California," which was 1,800 miles distant, but it is reported that the "Omaha" could not pick up the "California's" replies.

Not only in code dispatches did the "Omaha" radio experts excel, but with her 300-watt tube set, spoken messages were transmitted to Pearl Harbor, Honolulu, 2,300 nautical miles distant. They were also heard at Key West, Fla., approximately 2,100 miles over land and sea.

Part of the credit for the long-distant work is attributed to the 180-foot wooden masts, which carry the "Omaha's aerials almost 50 feet higher than the steel masts on battleships. The mean effective height on the "Omaha" is better than 100 feet, it is stated by naval experts. Her radio equipment is also installed on the "top-side."

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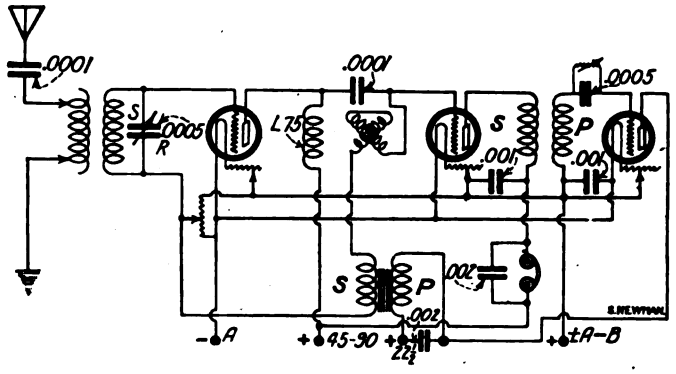
A Flexible and Selective 3-Tube Reflex Circuit

By H. Parsons

HAVING been experimenting during the past few months with the popular reflex type of receiver I finally hit on one that I think is about the best of them all. It is a modification of several and is very selective.

As every one knows, the main trouble with the reflex type of receivers is their lack of selectivity or "sharp tuning." If this set is carefully constructed and the best parts used the builder will be pleasantly surprised at the remarkable selectivity he can obtain if it is handled carefully and the tuning done systematically instead of just "turning knobs and dials."



Flexible yet very selective reflex circuit designed by Mr. Parsons. All the capacities and constants are specified in the drawing.

The tuner of this circuit consists of a Dayton moulded bank-wound variocoupler with secondary shunted with a 23 plate vernier condenser. It is imperative that the best apparatus be used.

The variometer which is used as a radio-frequency tuner is of the same make with all the condensers the popular micadon with brass cover. I specify this because of the liability of the paper condensers to blow if anything happens. If this should occur the circuit would be rendered inoperative and you would have to test each one, so a little extra expense will save a lot of trouble. The rheostats are all vernier control, six ohms resistance. These will handle the current for all the now popular types of tubes.

The radio-frequency transformer is an Acme R-2 and the audio-frequency is a Federal 226-W. It is not absolutely necessary to use these types or makes if another of high quality is on hand, but be sure that it is of the same ratio as those specified. The honeycomb coil can be of any popular type, either the D-L or the regular wound. If it is desired, a non-inductive resistance can be used in place of the honeycomb coil, and the B battery increased. This will then give resistance—coupling—amplification on the first tube.

When hooking up it is absolutely necessary to see that the leads are all as short and straight as possible. It is better to incorporate "B" line leads using lighting cable (one strand of the twisted kind) than it is to use bare bus wire. Run your leads direct and prevent them from bunching and crossing at anything but right angles, or capacity coupling will result and the selectivity will be nil. Group your A and B leads to give as much inductance effect as possible and at the same time keep down the capacity.

When tuning in first set your primary at the approximate point of resonance and tune your secondary condenser. Then using the variometer bring in the signals until the volume is at its highest point and the noise is cleared up. Now tuning with the potentiometer bring the signals in as loud as possible with the least amount of scratching. If the potentiometer is turned too far the circuit may howl and scream. It is important that the grid leak is set at the right point for the detector you are using. At this stage it would be best to get a panel mounting condenser and leak combined, as then the resistance can be changed with the least amount of trouble. It is ofttimes necessary to tune with this leak when real distance work is being done and there is a great amount of local interference.

Long Distance Radio Tests on Pacific Planned

RECENT tests between the Shipping Board Steamer "Easterner" and some land radio stations showed reception from East Hampton, N. Y., at 6,000 miles, while several other stations were heard almost continually throughout a cruise from Panama to Australia. These results were so surprising that further tests between high-powered Naval stations and Shipping Board vessels in the Southern Pacific are planned.

This interesting report received via the Shipping Board from the radio operator of the S.S. "Easterner," which recently made a cruise to Eastern Australia via the Panama Canal follows in part:

"Conditions in the South Pacific appear to be ideal for radio work. On both passages, I was favored with negligible static and interference in mid-ocean except about the equator. Using one step of audio-frequency amplication, the following results were obtained:

Atlantic Stations—	Call	Miles
East Hampton, N. Y.	WSA	6000
Cape May, N. J.	WCY	5200
Point Isabel	NAY	4000
Morehead City, N. C.	NAN	3100
Key West, Fla.	NAR	3000
Pensacola, Fla.	NAS	3000
Pacific Stations—		
Vancouver	VAE	5200
San Diego	NPL	4200
Honolulu	NPM	3400
New Zealand	VLC	2500

"Arlington was heard at 4200 miles. The high power stations Balboa (NBA), San Francisco (NPG), San Diego (NPL), Honolulu (NPM), and Guam (NPN) were all heard over practically the entire Pacific ocean from Panama to Australia. Longer wave stations could not be heard because the coils loaded only to 11000 meters."

The data from the "Easterner" was considered of such value in connection with the communications in the Pacific ocean, that immediate steps have been taken to arrange tests between high-powered Naval radio stations on the Pacific Coast and Shipping Board vessels making cruises to the South Pacific.

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A Portable Loop Set That Works Easily and Well

By Kenneth Malcolm, A. I. R. E.

ONE of the easiest ways to secure great selectivity, and at the same time reduce static disturbances to a minimum, is to use a loop antenna. Loops are generally located indoors and at no great height, where strays or atmospherics are present only in negligible quantities. Due to their marked directional characteristics they allow differentiation between stations of equal power but which lay at varied angles from the receiver. Loop sets also offer the advantage of simplicity and portability.

The greatest drawback that stays the hand of the average fan, is the idea of cost; for he thinks of a

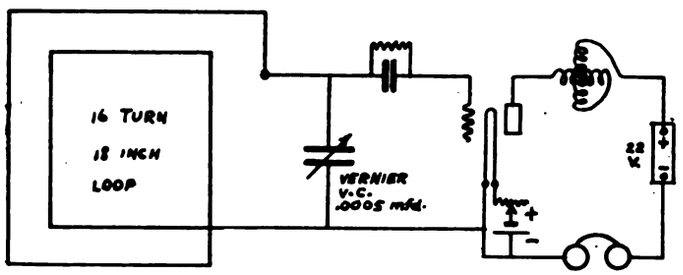

Fig. 1—Hook-up for Mr. Malcolm's Portable Loop Set.

loop set as always necessitating a half dozen or so stages of radio-frequency amplification. This is all well and true for DX work, but for reception over comparatively short distances—under 25 miles—a loop set can be constructed at small cost that uses but a single tube and at the same time employs a standard circuit. It is also the acme in portability and ease of operation.

Apparatus varies somewhat in size, but the dimensions given may act as a guide. The panel should be about 8½ inches wide by 7½ inches high. The cabinet should be about seven inches deep.

Other parts include a .0005 mfd. variable condenser (values depending upon the particular tube used), a variometer, rheostat, tube socket, tube (either dry cell or regular 6 volt), a single circuit jack with plug, three dials or knobs, about 70 feet of wire for the loop, several pieces of wood for the loop frame, A and B batteries, phones, and the necessary binding posts.

Secure the best apparatus that your money can buy and you will be more than repaid by the good results. If you desire, the set can be entirely self-contained by using a dry cell tube and securing a cabinet large enough to include the batteries.

Let us start by constructing the loop itself. Secure some wood about ½ or ⅝-inch square, and cut one piece 25 inches long and another 19 inches long. These may be best fitted together by using the half-lap joint, the joint commonly used on the cheaper Christmas tree standards. The two parts might be glued and a small brass screw or bolt passed through the center to make it strong and rigid. The outside turn of the loop is a square whose diagonal is 18 inches. The turns are spaced ¼-inch apart. There should be 16 in all, and they may be held in place by small brass screws, or small wood dowels that have been glued into holes bored in the cross-pieces. Iron or steel screws are especially undesirable. Most any sort of wire may be used, but Litzendraght has the lowest radio-frequency resistance and is therefore preferable.

The mounting of the loop is unique but simple. Secure a plug with a round insulating sleeve of a diameter sufficient to admit the end of the long loop shaft; you may have to cut off part of the end of the sleeve to do this. Fasten the two leads from the loop to the terminals of the plug and anchor the shaft by means of sealing wax or some other insulating cement. The corresponding jack should be mounted near the rear left hand corner of the top of the cabinet. This combination forms a simple and efficient means of rotating the loop and also allows the loop to be dismounted from the set at a moment's notice, for facility in packing or for the inspection of the set.

Next we can drill the panel and mount the instruments. The arrangement shown in the drawing is highly recommended. The left hand dial controls the variable condenser, the right hand the variometer, and the small dial at the lower center controls the rheostat.

With this type of circuit a condenser having a vernier is absolutely necessary; however, a separate vernier may be used, if you have one. The grid leak and grid condenser may be of a fixed value, and mounted inside the cabinet. Too much stress cannot be laid upon the value of a good grid condenser. Those having a mica dielectric are the most dependable, but there are a few good manufacturers who use paper. If you use a very critical tube it may be an advantage to have a vernier on your rheostat, otherwise this is not very important.

If you want to make your set truly portable, the WD-11, WD-12, and the UV-109 tubes are ideal.

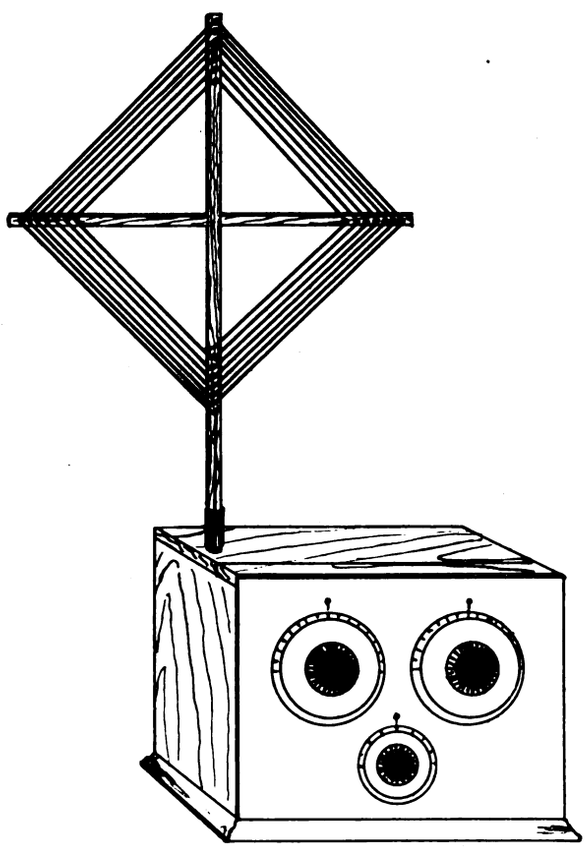

Fig. 2—Assembly of the Portable Loop Set Designed by Mr. Malcolm.

As, by its natural characteristics, a loop can absorb but a small percentage of the energy that could be absorbed by an open or regular aerial, every effort should be made to prevent losses. Whereas with the best of

(*Continued on next page*)

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Radio and the Woman

By Crystal D. Tector

(C. International Newsreel)

Blanche Sweet, charming star of the silver screen, interprets various facial emotions while listening over the radio. Reading from top to bottom, at the left: Bedtime Stories—"The Big Bear Jumped on the Little Rabbit." "Every one keep quiet, sh-sh-sh!" "Ouch! What noises!" At the right, from top to bottom: "Well, that's a good joke!" "Isn't that a good song? It makes me laugh!" "Oh, boy, that's real jazz! Come on and strut your stuff!"

Friend Husband has been real busy of late, coming home late, tired and too worn out to even read the evening papers. The reason is that he recently went into a partnership with a bright young star in legal circles. He told me this morning that he never realized until now what a real comfort radio was to people who were tired. "I never appreciated it before because I took it more as a pleasant game to be played by turning dials, but now when I am tired it is a real pleasure to sit in my comfy chair and listen to all that beautiful music and the news of the day. I just close my eyes and rest, and the world passes in review through our loud speaker:" Well, it certainly took him long enough to appreciate the work of the different broadcasters.

* * *

I have a letter from Mr. H. H. Taylor, advertising manager for the American Radio & Research Corporation, Medford Hillside, Mass., about the picture of Miss Thompson which appeared on the front cover of RADIO WORLD for April 28. Mr. Taylor takes issue with the title used over the picture, "Only Woman Graduate of a Radio School," and states that a year ago there were half a dozen women graduates of radio schools and that this number doubtless has increased since. My correspondent also informs me that Miss Eunice L. Randall, who gives the bedtime stories at WGI, his company's broadcasting station, is a graduate from the Eastern Radio Institute of Boston. Miss Randall is also a licensed operator (1CDP). If Mr. Taylor will read the caption below Miss Thompson's picture he will find her described as "the only woman graduate of the radio school she attended," etc. This is all very interesting and I would thank Mr. Taylor, or any others who read RADIO WORLD, to send me the names of women graduates of radio schools they may know. I have something I want to say to them.

(*Concluded from preceding page*)

instruments, assembled with the greatest care, very satisfactory results can be secured with the instrument described, it must also be remembered that with poor or less efficient instruments that have been thrown together with utter disregard of details, the set might not work at all.

So be careful. Use only the best thoroughly seasoned wood for the cabinet if any of the instruments are mounted on it; it is better that the instruments should not be, however. See to it that there can be no leaks in the loop on account of puncturing the insulation of the wire with a screw head. Make all the wiring as short and as rigid as possible, using No. 14 copper wire, or bus bar; this need not be insulated if you take care to arrange it so that there cannot possibly be a short-circuit. It is absolutely imperative that all joints be soldered. A good tube and a sensitive pair of phones will often change an absolute failure into a marked success.

The jack for the loop plug is connected by flexible leads to the other instruments, so that the cover may be opened without hindrance. No mention has been made of the battery and the phone connections, for individual taste varies much on this question. A very neat job may be engineered by mounting a small strip of some insulating material on brackets, inside the cabinet; on this strip are arranged the necessary binding posts for the A and B batteries, and for the flexible leads to the jack. The battery wires may be led in through small holes drilled near the lower part of the back of the cabinet.

Another method is to cut away a portion of the wood of the lower cabinet back, and mount the strip with the binding posts over this. Still another, but more unsightly, way is to mount the binding posts directly on the front of the panel. The phones may be attached to binding posts on the panel, or a plug and jack arrangement may be used.

The tuning is quite simple. First rotate the loop to a position approximating that of the station from which it is desired to receive, the cross-bar being the pointer. Turn on the filament of your tube to an arbitrary value; then manipulate the variable condenser dial. You may rotate the variometer at the same time. At some point you may hear a whistle; now you must carefully re-adjust the condenser and the variometer, and in a moment you will have your station. This may be brought in louder by moving the loop, regulating the vernier on the condenser, and regulating the filament current. The actual operation is really easier than the description.

If at any time you desire to get a greater range than is afforded by the loop, a variocoupler may be added, thus converting the set into an excellent three circuit regenerative receiver, and a regular aerial and ground may be used. Amplification may be added in the same manner as to any other set.

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The Improved Cockaday Four Circuit Receiver

By Russell P. May, R. E.

THOSE who have used regenerative receivers know the critical nature of the adjustments, especially that of the regeneration control. This is characteristic of all regenerative receivers, and extremely so in the ultra-audion. A new receiver, the creation of Lawrence M. Cockaday, the adjustments of which are very simple and the results surprisingly gratifying, is herewith illustrated and described. (See also RADIO WORLD, April 28, 1923.) Before going into details it will be well to briefly review the functioning of the regenerative receiver.

The action of the grid in a vacuum tube is to control the amount of current flowing from the plate of "B" battery to the filament. When a slight impulse is received it is impressed upon the grid. This impulse is of alternating character, and the voltage impressed on the grid rises and falls with it. These variations of grid voltage permit a relatively large current to flow in the plate circuit, the result being a true reproduction of the incoming signals.

In order to increase this amplification tubes were connected in such a manner that the output or plate circuit of one tube supplied the input or grid circuit of the next, increasing the signals at each step. Previously it was not known that even better results could be had with one tube when properly connected. It was only necessary for some one to find out how these connections were to be made. This was accomplished, simply and effectively, by Edwin H. Armstrong.

The incoming signals are extremely weak, and the voltages on the grid are likewise feeble, but the currents flowing in the plate circuit are enormous in comparison.

Armstrong placed a coil in close inductive relation to the secondary coil and provided means of varying their relation to each other. This coil was connected in series with the plate circuit, through which the current from the "B" battery had to pass before reaching the plate. A magnetic field is set up in this coil, which field varies precisely with the grid voltages, and, as the two coils are coupled together, this varying field induces varying voltages in the secondary coil. The result is that feeble incoming signals are reinforced, with a corresponding increase in the plate current.

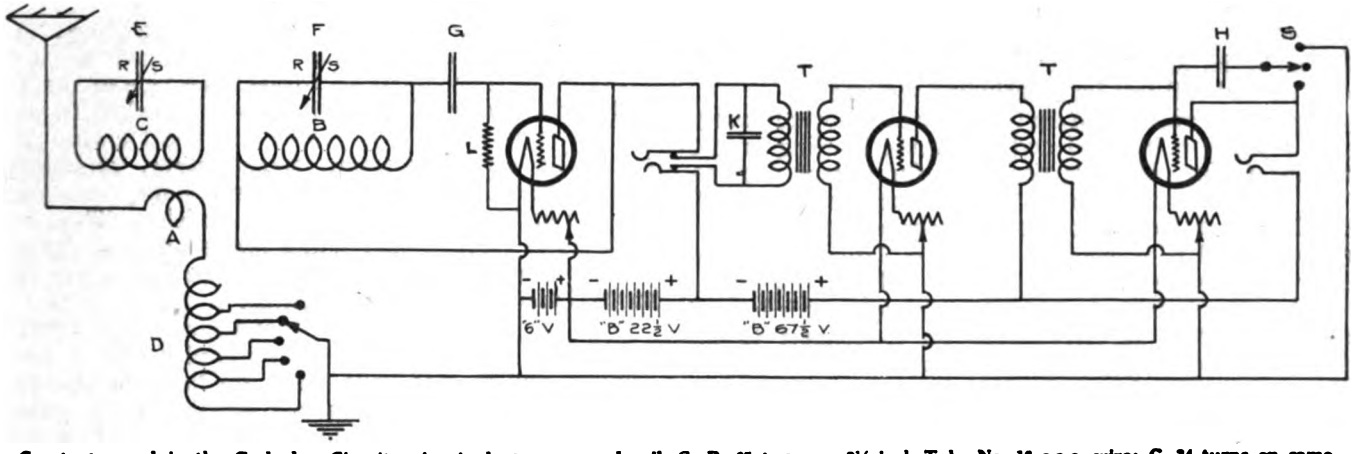
The effect of regeneration in a receiving circuit is to increase the negative resistance of the plate circuit, which is the equivalent of decreasing the effective resistance; so the only limiting factor is the capacity of the tube itself.

Due to this it is necessary to adjust the amount of feed back from the plate to the grid by adjusting the relation of the coils so that the reinforcing energy supplied to the grid could be controlled. There is a point in this action at which the tube will start to generate oscillations itself, and it is at this point that the signals are the loudest.

It is evident that regenerative control depends upon the control of the negative resistance. When it is too great the tube will oscillate, and when too small regeneration becomes weak. At the point approaching oscillation the signals are strongest.

It will be noticed in the diagram herewith that the secondary circuit is not the usual regenerative circuit. It is what is known as the ultra-audion circuit, with the grid and plate of the tube connected to each end of the secondary coil. This type of circuit is extremely critical and oscillates easily. The antenna system is of the semi-aperiodic type, which requires no condenser. It is coupled to the secondary circuit by means of a single turn, as shown at A. Adjacent to the secondary coil the coil C is placed, with a condenser connected in parallel with it. This is what is known as the fourth circuit. Its function is as follows:

When the coil A receives an impulse due to an incoming signal a comparatively high E. M. F. is induced in Coil B as the transformation ratio is very high, and therefore the grid is strongly impressed. On account of this high ratio even the weakest signals manifest themselves in the secondary circuit, and this accounts for the long-distance reception this circuit is capable of. The plate current resulting from this weak signal is therefore correspondingly large. This method, if used in a plain ultra-audion hook-up, would be very unsatisfactory, as any signal would be sufficient to cause it to spill over or to oscillate. It is therefore necessary to provide a means of controlling the regenerative action, and this is accomplished by means of the fourth circuit. The coil C is within the magnetic field of the grid coil B, and when condenser E is varied the reactance between this circuit and the grid circuit is varied. It will be seen that, if the tube circuit is in an oscillating condition, there will be a point in the fourth circuit, or what is known as the stabilizer circuit, at which it will absorb energy from the grid coil B. This is equivalent to inserting resistance in the grid circuit, and, as before mentioned, the grid circuit resistance, positive and negative, determines its point of oscillation. It is evident that if this circuit is in an oscillating condition the stabilizer can be adjusted to absorb enough energy from the grid circuit to just stop it from oscillating where signals will be heard strongest.



Constants used in the Cockaday Circuit: A, single turn around coil C; B, 65 turns on 3¼-inch Tube No. 18 s.s.c. wire; C, 34 turns on same tube 1/16 inch from coil B; D, 43 turns double bank wound tapped at 3, 7, 13, 21, 31 and end (set at right angles to B & C); E and F, .0005 variable vernier condenser; G, .00025 fixed condenser; H, .001 fixed condenser; K, .0005 fixed condenser; I 1 megohm grid leak; T1 Amertran transformer (audio); T2 General Radio transformer (audio); S, 3-point switch.

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How to Construct and Tune a One Bulb Regenerative Set for Long Distance Work

(*Continued from page* 1)

Don't expect to get good results on distant stations unless you tune very, very carefully.

A great percentage of the efficiency of your outfit is in the tuning, and if you will learn the purpose of each instrument in your set you will get the most out of it. A combination of a good set with good tuning is what brings you the distant stations.

A single steel copper coated wire makes a very good receiving aerial and should be about 150 feet long, including the lead in; however, 175 or 200 feet will work satisfactorily with this set. The L top aerial, which receives slightly better from the lead in end should be pointed toward the distant stations you wish to receive.

Run your aerial at right angles to power lines, if possible, to avoid inductance. Also keep the aerial at least four feet away from tin roofs, spouting, etc.

Insulate your aerial perfectly with good insulators and solder any splices in case it should be necessary to splice two wires together. A tube insulator such as is used in house-wiring makes a good insulator through which to bring your lead in wire through the window frame or through a board the width of the window sash installed either above the upper sash or below the lower sash.

The higher your aerial the stronger the signal strength; also the stronger the static. However, make your aerial high and you can lower it in summer if you wish. We are using an aerial forty-five feet high at one end, fifty-feet at the other and 150 feet long, including the lead in.

Keep your aerial drawn up tight, for as the wind swings it the capacity is changed and will cause howling on the very fine tuning which is necessary for distant stations.

The material you will need for this set consists of 150 to 200 feet of No. 14 copper or copper-plated solid or stranded aerial wire, enough No. 14 or larger copper or copper-plated wire for your ground. The length of the ground wire will depend on the distance your set is located from where it is necessary for you to connect to the ground and should be as short as possible.

Two antenna insulators, one tube insulator, one standard variocoupler for tuning the primary with the units; ten taps and contact points for each tap; also two switches for the contacts in case you intend to install the set in a cabinet. If you are not going to assemble the set in a cabinet you need not purchase the two switches or contact points, but instead use two small clips, similar to storage battery clips, one soldered to the aerial wire and the other soldered to the ground wire.

In case you have a good variocoupler which is not of the units-tens type you can use it very nicely by the addition of a vernier .0005 variable condenser installed in the aerial or ground circuit. This condenser will allow you to tune your primary or aerial circuit between the taps on the coupler. You will also require:

1 Vernier .0005 condenser for tuning the secondary circuit. (Panel mounting type.)
1 Standard variometer, moulded bakelite preferred, for tuning the plate circuit.
1 Standard detector tube.
1 Standard detector tube socket.
1 Variable grid leak.
1 .00025 fixed grid condenser.
1 Vernier rheostat (for panel mounting).
1 Board.
1 Potentiometer, 200 or 300 ohms for panel mounting type connection across "A" battery.
1 .001 fixed condenser.
1 .002 fixed condenser.
1 Pair good 2,000 ohm phones.
1 22½ volt "B" battery.
1 80 ampere hour storage battery or at least 100 ampere hour capacity if you intend hooking to an amplifier now or at a later date.
15 Feet No. 18 tinned or copper wire for connections.
2 Phone binding posts.
1 Piece of bakelite or hard rubber 3/16 x 6 x 8 inches.
1 Piece of bakelite or hard rubber 3/16 x 1 x 3 inches for mounting phone binding posts.

Follow the directions already outlined for installing the aerial. You should have a pulley on one end so that you will be able to lower the aerial if necessary; also, it will be much easier to keep the aerial tight to prevent swinging. Keep in mind that the aerial receives better from the direction to which your lead in is attached. Your ground wire should be at least No. 14 gauge and should be made as short as possible from your instruments to the nearest water pipe at a point nearest where the water pipe enters the ground. After cleaning the water pipe thoroughly with a file, the ground wire should be wrapped on for about a dozen turns then well soldered to the water pipe. If you do not have a water pipe on which to make a ground connection a gas pipe will do, but as a rule does not make as good a ground connection.

The instruments should be installed on a board one-half inch thick by six inches wide. Everything should be perfectly insulated with all connections made as short as possible, particularly the connection between the grid leak and the grid. All the instruments should be connected as outlined in the diagram and checked over thoroughly to be sure they are right. The plate variometer next to the plate terminal of the vacuum tube, then one side of the phones should be connected to the other side of the variometer, then comes the "B" battery. The rheostat should be connected in the negative side of the filament circuit, etc. The vernier rheostat, potentiometer, variable condenser and .001 fixed condenser are mounted on a piece of bakelite or hard rubber 3/16 x 6 x 8 inches. The variable condenser, rheostat and potentiometer are of the panel mounting type. The bakelite panel should then be attached to the board in an upright position.

The red or colored cord from your phones should be attached to the terminal going to the plus side of the "B" battery, and in case your cords are both the same color you can try attaching them to your phone posts first one way and then the other, leaving them the way in which they bring in the signals loudest. This is important in order to get in the distant stations and give long life to your phones, for if the "B" battery current goes through your phones in the wrong direction it has a tendency to demagnetize the telephone magnets as well as decrease the signal strength.

If you will look over the construction of your units-tens variocoupler you will notice that by proper manipulation of the aerial and ground clips you can cut in one turn of wire at a time from the bottom of the primary to the top with the exception of a few turns in the center of the primary. The primary circuit consists of the aerial, primary, variocoupler and ground connection. The tuning to the wave length you wish to receive is all taken care of by the primary or the variocoupler. The secondary circuit consists of the secondary of the variocoupler, L2; the variable condenser, C1; the grid leak, grid leak condenser and connections. This secondary circuit should be tuned to resonance with the primary. The variometer, L3, in the plate circuit, is for tuning the plate circuit to resonance with the secondary circuit in order to make the set regenerate. The fixed condenser C4 is for the purpose of by-passing the radio frequency currents around the phones and also "B" battery. The radio-frequency current is not required in the phones, as only the pulsating direct current is used to operate the phones; therefore, by shunting this con-

(*Continued on next page*)

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Valuable Advantages of Instruction by Radio in Public Schools

By William L. Ettinger
Superintendent of Schools of New York City

THE experiment in teaching a class by radio, recently carried on at the Haaren High School, New York City, through the courtesy of WJZ and the Radio Corporation of America, was an unqualified success. While I do not believe that this method of instruction will ever do away with the services of the classroom teacher, yet I am convinced that a new field in education has been opened by this experiment, which has wonderful possibilities.

In a large city system it is often necessary to get official notices to schools in a very short space of time. In New York City, where there are over 500 elementary schools, 32 high schools, and numerous special schools, it is obvious that the mere mechanical work involved in sending out such a notice requires the time of a considerable number of people. With a broadcasting station at educational headquarters and receiving sets in all the schools the problem would have a simple and instantaneous solution. All large cities in the country have conditions similar to those in New York City.

Directors of special branches, special teachers and supervisors could give demonstration lessons directly to groups of teachers or classes, with a great saving of the time now wasted because teachers are obliged to travel long distances in order to attend a conference at some central place.

Famous men frequently visit the city, and they are sometimes willing to address school assemblies, but only one or two schools are fortunate enough to hear them. Radio communication would make it possible for all the school assemblies in the city to hear such a speaker if he were stationed at school headquarters. When one considers that schools all over the country may listen in at the same time, the possibilities for hearing great speakers seem to be almost unlimited.

In rural school communities the chances for radio instruction are much greater than in cities. No longer need the rural school be isolated or entirely dependent upon the services of a few poorly trained teachers. The country school-house can now be put in touch with the best instruction in the world by simply installing a radio set.

A suggestion may not be out of place here. Many schools having receiving sets are unable to get much that is worth while during the hours of the day that classes are in session. Could not a movement be inaugurated for having broadcasting stations send out educational programs suited for school instruction during these hours? A movement of this kind would be of great benefit to schools already possessing radio sets and would also be an inspiration to other schools to purchase them.

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denser around the phones and "B" battery you cut out a considerable amount of resistance for the radio-frequency current which travels through the plate circuit. The fixed condenser, C3, which connects the movable contact on the potentiometer and the plus lead of the storage battery circuit, is used for the same purpose as condenser C4. The ground connection from the plus lead of the storage battery is used to cut out induction.

In tuning for distant stations it is well to first tune in a nearby station on, say, a 400 meter wave length to the exact tune with your primary and secondary circuits, first turning on your rheostat to the point where you hear a hissing in the phones and having the movable contact on the potentiometer set about one-fourth the distance from the plus lead connection of the storage battery and with the vernier plate on the variable condenser about half-way in between the fixed plates of the condenser. This setting of the vernier condenser will allow you to get a fine adjustment by its use after you have already tuned in with the regular condenser dial. You should tap on the 18 volt tap of the "B" battery provided it is reasonably new, otherwise you may tap on for more voltage. The proper tap can be determined by experimenting.

The plate variometer should then be adjusted until the loudest signals are heard in the telephones without distortion. The rheostat should now be turned back and left at the point where you get the signals in loudest with the least amount of noise or hissing and the potentiometer should be changed to the point where you get the signals in loudest without hissing.

Turn on the rheostat a little stronger or until you hear the hissing again and then go after a much more distant station which you know to be on a 400 meter wave length. Change the secondary condenser or the plate variometer or a combination of both, or possibly changing the primary connection one or two turns either way until by careful manipulation you get in the distant station loud, then adjust the vernier rheostat again until the broadcasting is loudest with the least amount of hissing or noise; after which you should stabilize the circuit further by use of the potentiometer. You will notice as you adjust the variometer for a distant station you will first get a squeal, which is the carrier wave, and as you turn the dial slightly the frequency of the carrier wave will become less and less until you reach a point where you cannot hear it and as you turn the dial still further you again hear the carrier wave, the frequency increasing as you turn the dial. The dead or zero point of this squeal is called the "zero beat," and is the best possible adjustment for the reception of music, for then you will have maximum volume and no distortion. You should now change the variable grid leak to the point where you get the loudest signals without distortion, then leave it there, as this is the proper setting for all stations for the detector bulb which you are using. If you should later install another detector bulb you may have to again adjust the grid leak. About one-half megohm is correct for the radiotron or Cunningham detector tubes.

By first tuning in a local or nearby station you get roughly the proper adjustment of your circuits. Then by tuning in a more distant station you get still finer adustment on the circuits for 400 meter wave length. Now if you have tuned in a distant station very carefully you can possibly get a much more distant station or stations by careful adjustment of the plate variometer only. If not successful in this change the secondary tune slightly by use of the variable condenser; then with the variometer, go after the "zero beats" of the carrier waves you may hear.

The three circuit tuner provides the best method of receiving what you want to hear and eliminating what you do not wish to hear. However, you have to pay for the extra distance over which you will be able to receive and for the eliminating of interference, by some very careful tuning. If you do not tune very carefully you can very easily run through some of the very distant stations without hearing them at all.

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WEAF, The Last Word in Broadcasting Studios

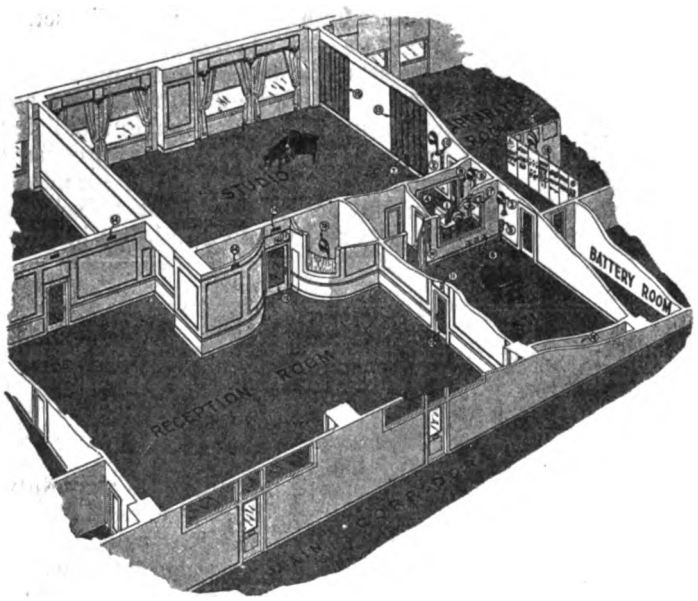
By Edgar H. Felix

COMPRISING the latest developments in studio acoustics, arrangement and technical improvements WEAF's new studio and remote control facilities in the Telephone and Telegraph Building at 195 Broadway, New York City, are the latest in broadcasting.

Minute attention to detail is responsible for much of the improvement in acoustic properties. The parquet floors are laid in pitch and are insulated from the walls of the studio. False walls are used between the studios and the hall to introduce a dead air space, making them practically impervious to sounds in the hall.

The draperies on the walls are so hung that they can be adjusted to give the correct degree of deadening. Heavy brass bands require more deadening than a quartette or a pianist. A speaking voice requires the least deadening for good transmission.

The paramount feature of the new studio installation



Isometric view of the new broadcasting layout of Station WEAF.

is the use of two studios, a small one for singers, speakers and small groups of instruments and a second large studio for bands, large choruses and orchestras.

The use of two studios will improve the running off of programs because it will obviate much of the delay to which the radio audience is subjected when single studios are used.

The accompanying illustration shows the arrangement of the new studios. The announcer's microphone (1) is located in a sound-proof booth having double plate glass windows and giving clear vision to both studios. Special walls render the booth impervious to outside interference. The loud speakers (2) and (3) in the studios repeat the announcer's introduction of the artists and also enables him to give directions regarding the placing of instruments and singers while the studio is idle. Switches on the announcer's panel (4) enable him to switch in his own microphone or those in the large and small studios (5, 6 and 7). There are two microphones in each studio, one regular and one emergency. The announcer's loud speaker (8) enables him to hear the performance as it is heard by his large unseen audience so that he gives his directions from the listener's point of view instead of a studio one. The signal lights (9 and 10) indicate by colored lights. whether the studio is on the air, the carrier wave is being sent out, the microphones are switched in or studio director or announcer are wanted on the telephone. Each door of the studios has a red signal light (11) which indicates that the particular studio is broadcasting at that time. If any one disregards this signal and opens the door when transmission is taking place, the loud speakers are automatically disconnected. As a further precaution the doors (12) are equipped with special knobs which can be opened only by one that is familiar with them. A loud speaker (13) concealed in a closet reproduce the entertainment for anyone in the reception room. A ventilation system (14) keeps the studios cool and well ventilated under all conditions. Adjustable deadening curtains (15) are readily adapted to suit the form of program being transmitted. A double wall with dead air space (16) prevents radiation of hall and elevator noises from the main corridor to the studio. The announcer who is the king of the whole situation is in direct communication with the engineers through line telephone (17). The equipment panel (18) is mounted with all necessary apparatus for controlling the microphone amplifiers and input currents to the special cables connecting the studio with the station as well as the station to outside points. Special equipment for equalizing lines to correct attenuation as well as instruments for measuring the gain of any amplifier or group of amplifiers are provided. Behind the panels is a large loud speaker (19) which provides the monitoring engineers with either the studio output or with the output of a loop receiver.

Radio Traffic in Italy Rapidly Increasing

The volume of radio traffic in Italy has increased at a surprising rate during the past four years, Trade Commissioner Osborne at Rome reports. In 1919, Italian statistics show only 50,000 words were transmitted, but it is now estimated that in 1923 this will increase to seven million words. This month a new station at Coltano, Italy, will be opened for commercial traffic and direct communication between New York and Rome will probably be established. Today this traffic is handled via Berlin, Paris or London.

Coming! New List of Broadcasters!

While the Department of Commerce has assigned wave lengths for each of the broadcasting zones established by the recent Second National Radio Conference, individual assignments of station wave lengths have not been announced. They are being arranged as rapidly as possible and as soon as finished A COMPLETE, UP-TO-DATE LIST OF BROADCASTERS will be published by RADIO WORLD.

The allocation of wave lengths for ten new Class A stations appears in this issue of RADIO WORLD.

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New Jersey Radio Manufacturers Move for Stability in the Industry

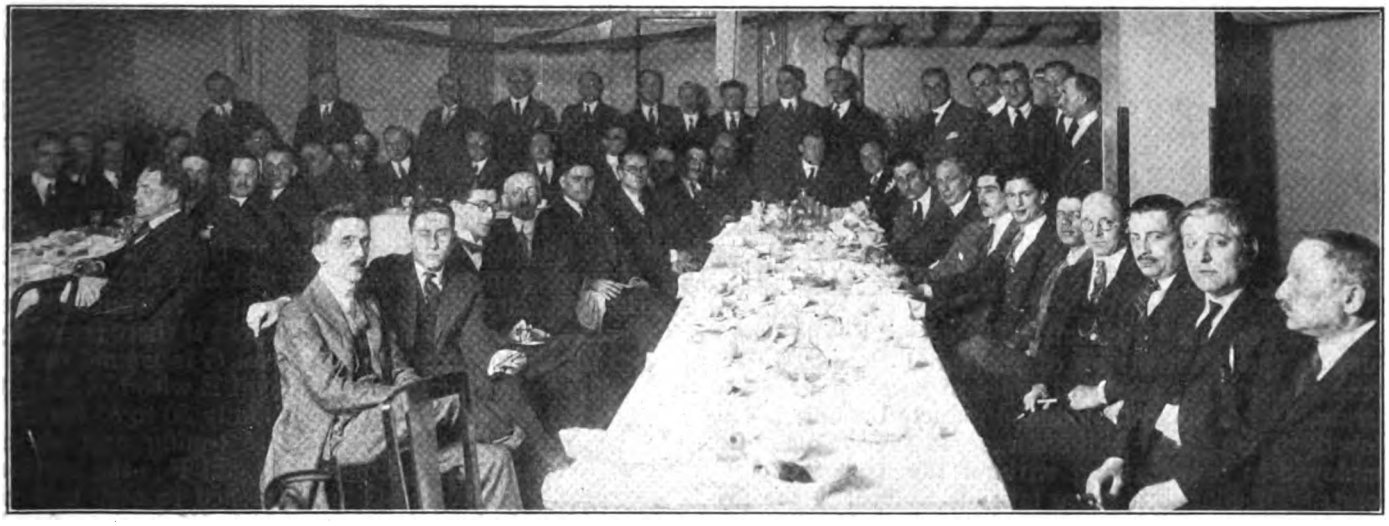
IT is an apparent fact that New Jersey is an important center of the radio manufacturing industry. During the past few years many of the largest and best equipped radio manufacturers have located in and around Newark, the big city of New Jersey.

Because of the tremendous growth of this industry during the period of the boom, and the consequent failure of many manufacturers when the market became flooded with inferior goods due to turning out quantity production rather than quality, it was thought a good plan to organize for the protection of the trade.

To stabilize the industry, keep it on a firm business basis and protect the reputable manufacturers, the Radio Manufacturers' Association of New Jersey was organized on April 5, 1923, with 31 reputable manufacturers as charter members.

The officers elected and who will serve until the end of the year are: W. S. Lefebre, Sheltone Mfg. Co., president; J. A. Harvey, Harvey Mfg. Co., vice-president; Ross Amos, Fibre Products Co., treasurer; H. L. Denburg, Royal Electrical Laboratories, secretary.

The charter membership of this organization includes the most active and reputable firms engaged in the business of manufacturing radio parts and sets, and is as follows:



Representatives of the radio industry at the dinner of the Radio Manufacturers' Association of New Jersey, Newark, N. J.

A. B. Cole Co., Newark; Adams Morgan Co., Upper Montclair; Ajax Elec. Spec. Co., Newark; Daven Radio Co., Newark; Davis Radio Co., Keyport; Diamond Spec. Co., Newark; Duranoid Co., Newark; Eagle Radio Corp., Newark; Essex Spec. Co., Berkley Heights; Fibre Products Co., Newark; Lloyd Gehman, East Orange; Harvey Mfg. Co., Newark; Mack Moulding Co., Little Falls; Metro Elec. Co., Newark; Multiple Elec. Prod. Co., Newark; Mydar Co., Newark; Murad Laboratories, Asbury Park; Newark Spinning & Stamping Co., Newark; Radio Detector Co., Newark; Royal Electrical Laboratories, Newark; Shamrock Mfg. Co., Newark; Shaw Insulator Co., Irvington; Sheltone Mfg. Co., Newark; Standard Crystal Co., Newark; Standard Metal Co., Newark; Standard Radio & Equipment Co., Newark; Thresher Radio & Mach. Co., Newark; Union Radio Co., Newark; United Specialties Co., Newark; W. B. L. Radio Co., Newark; Woodside Mfg. Co., Newark.

As reported in RADIO WORLD last week, a combined business meeting and dinner was staged by the Radio Manufacturers' Association of New Jersey and the Radio Trade Association at the St. Francis Hotel, Newark, on the evening of April 26. In the accompanying illustration is portrayed the attendance at the dinner which included the following gentlemen:

C. B. Cooper, Crosley Mfg. Co., 1803 Tribune Bldg., New York City; H. C. Gawer, R. C. A., New York City; W. S. Lefebre, Sheltone Co., Newark, N. J.; John A. Harvey, Harvey Mfg. Co., Newark, N. J.; W. E. Harkness, A. T. & T. Co., New York; George F. McClelland, A. T. & T. Co., New York; William R. Brogh, W. B. L. Radio Co., Newark, N. J.; Otto Herschkowitz, Ajax Radio Corp., Newark, N. J.; Jack Larson, W. B. L. Radio Co., Newark, N. J.; A. R. Mortan, Clapp-Eastham "Radak," 395 Broadway, New York City; W. H. Frasse, Daven Radio Co., Newark, N. J.; P. W. Golden, A. B. Cole, Inc., Newark, N. J.; T. F. W. Meyer, Mydar Radio Co., Newark, N. J.; L. E. Gehman, L. E. Gehman & Co., Newark, N. J.; G. A. Thomson, Diamond Elec. Spec. Corp., Newark, N. J.; F. M. Rosenfeld, Diamond Elec. Spec. Corp., Newark, N. J.; Harvey Mansfield, Radio Broadcast, Garden City, N. Y.; Arthur H. Lynch, Radio Broadcast, Garden City, N. Y.; F. M. Artley, Artley Products, Inc., Jersey City, N. J.; R. E. Perrin, Artley Products, Inc., Jersey City, N. J.; Mortimer Salzman, Wholesale Radio Equip. Co., Newark, N. J.; D. McCormack, Radio Supplies, Newark, N. J.; W. B. Curtiss, Curtiss Radio Sales Co., Newark, N. J.; H. R. Rose, Shamrock Mfg. Co., Newark, N. J.; D. W. May, D. W. May, Inc., "W. B. S.," Newark, N. J.; F. Russell, Shamrock Mfg. Co., Newark, N. J.; D. Wald, Wald Electric Co., New York City; Charles A. Gould, Gould Storage Battery Co., New York City; O. H. Caldwell, Electrical Merchandising, New York City; H. L. Denburg, Royal Electrical Laboratory, Newark, N. J.; A. Rubin, Henry Hyman Co., 476 Broadway, New York City; B. Muldoon, Henry Hyman Co., 476 Broadway, New York City; E. Anglin, Henry Hyman Co., 476 Broadway, New York City; L. A. Nixon, The Radio Dealer, New York City; M. P. McNeely, The Radio Dealer, New York City; D. S. Walker, Harvey Wire Co., Newark, N. J.; James P. Black, Harvey Wire Co., Newark, N. J.; Ralph Coen, The R. C. Mills-The R. C. Outlet, New York City; Harry S. Welker, The Wireless Age, New York City; Victor Hamerslag, Newark Ledger, Newark, N. J.; A. O. Karsten, Royal Electrical Laboratory, Newark, N. J.; H. E. Bennett, Radio Dealer, New York City; Edward Reese, Standard Crystal Co., Newark, N. J.; Edward L. Becker, Crocker-Wheeler Co., Ampere, N. J.; Stanley C. Bryant, L. S. Brach Mfg. Co., Newark, N. J.; J. Maurice Casper, Radio Dealer, New York City; H. Barron, Rooker & Barron Mfg. Co., Newark, N. J.; George Ollendorf, National Light & Elec. Co., Newark, N. J.; F. C. Manning, United Spec. Co., Inc., Newark, N. J.; A. M. Joralemon, National Carbon Co., Long Island, N. Y.; W. R. Lawrence, Standard Metal Mfg. Co., Newark, N. J.; Ross Amos, Fiber Products Co., Newark, N. J.; Arnold D. Friedman, RADIO WORLD, New York City.

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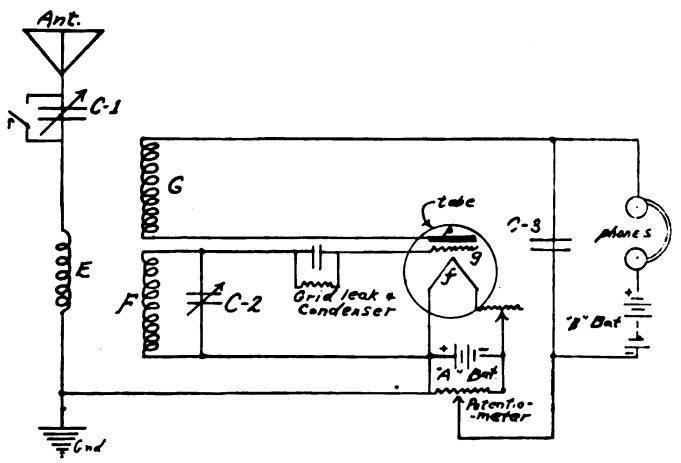
A Remarkably Good Selective Receiver

By C. White, Consulting Engineer

THE results that can now be obtained with a well-made single circuit regenerative tuner are really nothing short of remarkable. But the users of such outfits in some cities and certain localities are experiencing quite a bit of trouble with interference. It is, indeed, sad that the single circuit tuner has not the selectivity of the more complex types, for without doubt it has good volume. Then again, a single circuit tuner will pick up more interference from your neighbor's set than a coupled circuit tuner. Aside from the fact that a single circuit is simple to operate one of the most potent reasons for its popularity is its economy. The triple circuit tuner with its two variometers and a variocoupler to start with costs more than the best type of single circuit affair. Yet if the ambitious radio fan will take his time and patience he can actually build a triple circuit tuner for the same



Connections for the tuner and hook-up of Mr. White's selective receiver.

cost as a good single circuit. The secret of the whole thing is the construction of the tuner elements. Instead of using the standard types of variocouplers and variometers, a special combined inductance unit is employed. The coupler will embrace all the wavelengths employed in broadcasting without the use of switch-points. Of course, if more latitude is desired the primary can be loaded by means of honeycomb coils.

In the illustration herewith is shown the connections of the tuner. The primary circuit can either be tuned or untuned depending upon the type of signal and the amount of selectivity desired. A tuned primary will give greater selectivity. The secondary is likewise tuned, still further increasing the selectivity of the tuner. Although tuning the secondary by means of a condenser instead of a variometer is not as desirable, yet owing to the quiet operation of the former and the saving of time in adjusting for operation, I certainly think that the sacrifice is justifiable. The ordinary three circuit tuner is too selective for the average novice to operate with ease, while a single circuit removes this trouble but adds the one of poor tuning. This receiver lies between the ordinary single circuit and the standard triple circuit in sharpness of tuning. The constants of the circuit are as follows: The condenser C-1 is a 23 plate air variable, C-2 is an 11 or 13 plate air variable, and C-3 is a .002 mfd. mica condenser used as a bypass. The size of grid leak and condenser will depend solely upon the tube used, but, as a general rule a .00025 mfd. condenser with a two megohm leak will suffice for most cases. It is very desirable to procure a mica condenser and a good grid leak in order to insure quiet operation.

Owing to the fact that there are so many different types of detector tubes upon the market it is of the strictest importance to see that the filament rheostat has a resistance large enough to give ample room for gradual and steady filament control. Do not try to operate a UV-199 tube with a six ohm resistance for a rheostat and expect to get very wonderful results. As a good rule of thumb it is well to remember that the resistance of a rheostat should be about the voltage rating of the tube divided by the rated filament current of the tube. For an example, the new UV201-A radiotrons have a filament rating of .25 ampheres at five volts. Dividing five by .25 we get 20 ohms as an approximate resistance for the filament rheostat. Remember that the figure is only approximate but it is obvious from the little calculation that a six ohm rheostat will not do the trick in the right way. A potentiometer of 250 or 300 ohms is employed to smooth out the regenerative adjustment thus adding increased stability to the tuning in of distant and weak stations.

As I previously have stated the trick to the economy of this particular three circuit receiver is the construction of the tuning element E, F, and G. The coil E is wound with No. 22 D.C. magnet wire on a good molded bakelite or formica roter. It should have about 40 to 50 turns. The coil F is stationary and is wound on a four-inch bakelite or formica tube. It should have about fifty turns with No. 22 D.C.C. wire. This coil should be wound with the wire spaced apart. This is best accomplished by winding the wire with a piece of cord between each turn of wire and the next, shellacing the finished coil and removing the cord when dry. This arrangement spreads the coil and decreases disturbed capacity, the foe of selectivity. It would be well to wind the coil E in a similar manner if there is enough room on the rotor form. The coil G is wound on the same type of rotor form as the coil E with No. 22 D.C.C. magnet wire likewise, but has only 30 to 35 turns.

The assembly of the complete tuning unit should be as follows: The secondary or coil F is the stationary form, coils E and G are attached to each end respectively of the tube upon which W is wound. In other words the unit looks just like a standard variocoupler which has two rotors, one at each end of the stator tube, instead of one at one end only. Care should be taken in the mechanical construction to see that the two rotors do not touch when moved. The tube should not only be long enough to prevent this, but also for ample fastening of the rotor shafts on to the tube at each end. The coupling between the secondary and the primary can be adjusted separately from the tickler coupling. If the primary were made the stator then the secondary would be movable, and when the secondary and primary coupling would be changed the tickler coupling would be altered in the same amount approximately.

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"This Is Station WGY Schenectady" —Its Powerful Equipment

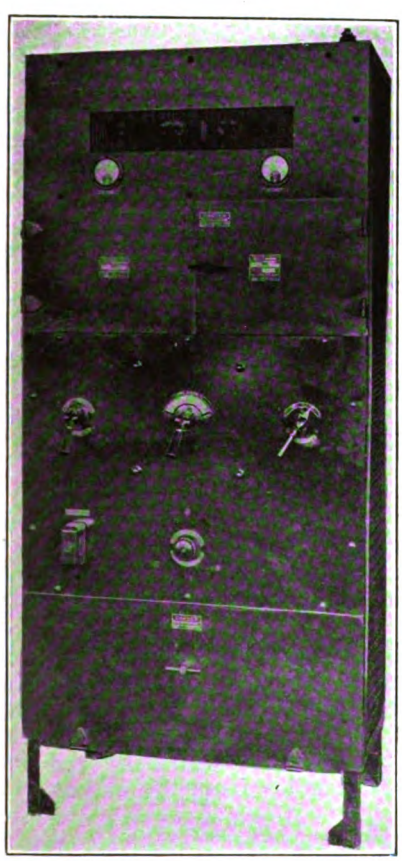
By Robert L. Dougherty

TO many broadcast listeners, station WGY, General Electric Company, Schenectady, N. Y., does not need any introduction. It will be of interest to readers of RADIO WORLD, however, to know that this powerful station has practically covered the entire Western Hemisphere. Its western record is Hawaii, a distance of over 5,000 miles direct air-line, and its eastern record is Paris, France, a distance of 3,225 miles. Its southern record is Peru, a distance of 3,230 miles.

The apparatus in this marvelous broadcasting station, since its installation 12 months ago, has been constantly changed to eliminate all objectionable features in an effort to make it one of the most powerful in the land.

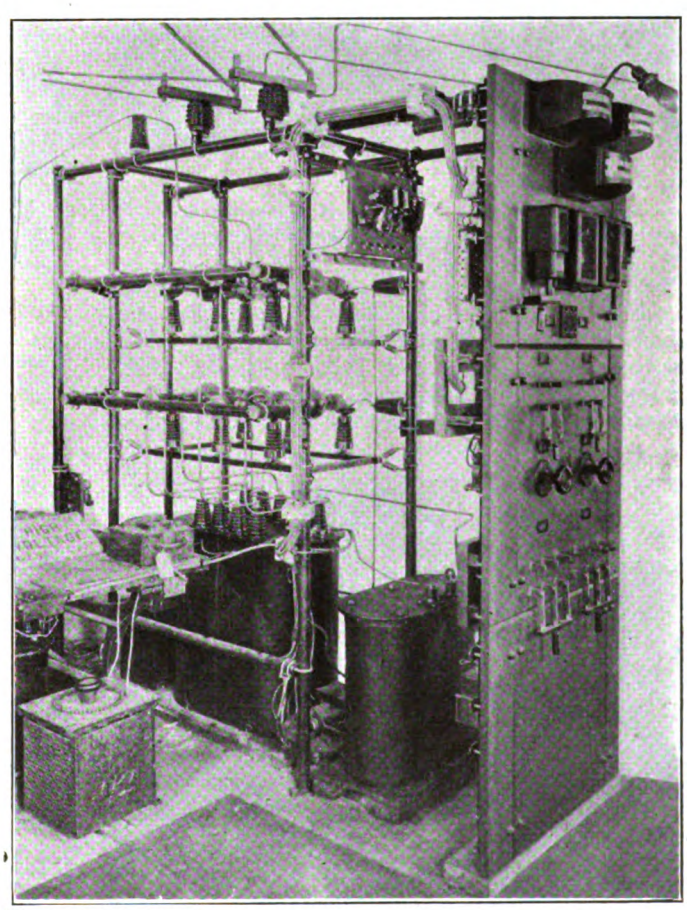
ing of time signals. In order successfully to accomplish this, WGY uses the apparatus shown in Fig. 4. This consists of a special trap circuit, shown on the extreme left hand, a tuning unit next to it, and a special set of amplifiers, with a power amplifier, at the end to boost the current, which is then transmitted directly into the set by means of a loud speaker.

In order to broadcast services from the different churches and institutions, it is of course necessary to have separate control at the place where the service or program takes place. This instrument is shown in Fig. 3. With this apparatus the man located at the transmitting end is enabled to control perfectly the program as to modulation and loudness before it is sent over the land lines to be further amplified and



(C. Photonews, N. Y.)

Fig. 1—1-KW transmitter panel, such as used at WGY, Schenectady, N. Y.



(C. Photonews, N. Y.)

Fig. 2—Kenotron assembly panel, used to supply 12,000 volts D.C. to the plates of the tubes.

Fig. 1 shows the 1-kw transmitter control panel as now used by this station. With this panel either CW, ICW or telephone may be used at the will of the operator. It employs four 250-watt radiotron tubes—two as oscillators and two as modulators—with two 50-watt radiotrons as speech amplifiers. The current for this panel is supplied from a three-unit motor-generator. It is a double-current self-excited generator and a high-voltage direct-current generator, driven by a single phase direct current motor, supplied from a 110-volt line.

This station is particularly successful in the relay-

then broadcast, by means of the regular station equipment. By this method finer adjustment is possible and the man at the transmitter of the station does not need to bother with anything else but the fact that the amplifiers, and broadcasting transmitter are functioning satisfactorily. Such equipment as this is getting to be quite common in the cases where the actual performers are located at a great distance from the studio, and it is by the use of such apparatus as shown that perfect modulation and transmission can be obtained, with the least amount of trouble and the conditions

(Continued on next page)

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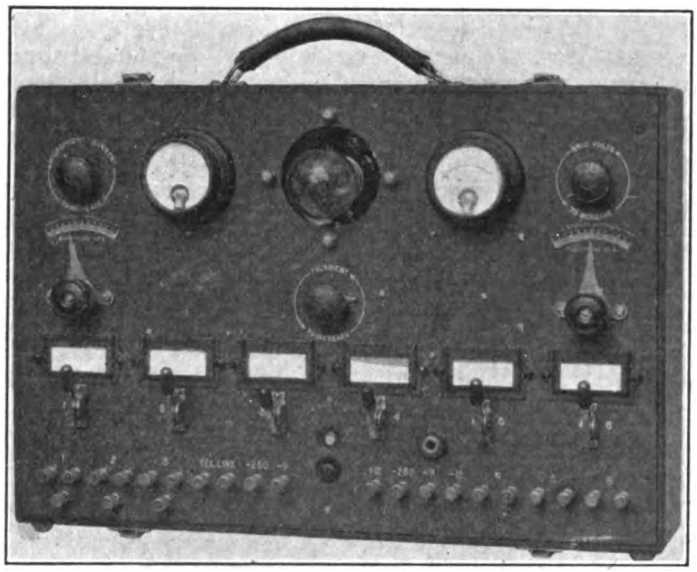
(*Concluded from preceding page*)

along the line changed, to suit the nature of the performance.

When this station is operating on full power, 12,000 volts must be supplied to the plates of the tubes. This is done by the kenotron rectifier shown in Fig. 2. In the rectifier the delta-connected primary is supplied from a three-phase 220-volt generator. The high tension windings of the transformers are connected to form two Ys, 180 degrees out of phase. Each Y, with its rectifying tubes (kenotrons), is thereby a half-

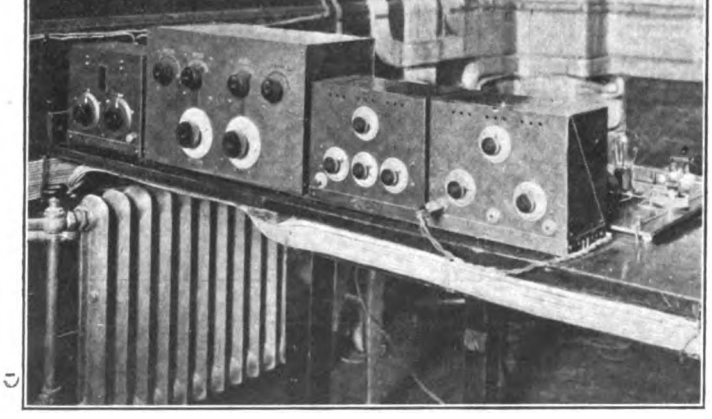


(C. Photonews, N. Y.)

Fig. 3. Church control system panel. Used where a program is to be broadcast from a distant point and no amplifying system is present.

wave rectifier. There are six kenotrons used in this set, the holders for which are directly back of the board. This rectifier will allow 12,000 volts to be supplied to the plate current, but with a ripple effect of less than one-tenth of one per cent.

The oscillator and modulator assembly is illustrated in Figure 5, and utilizes a tank circuit loosely coupled

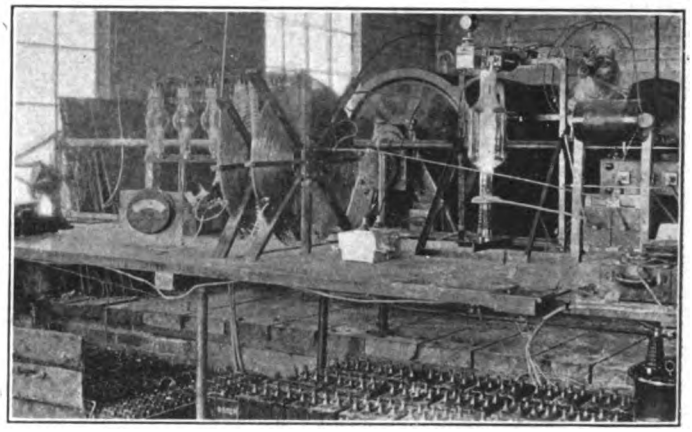


(C. Photonews, N. Y.)

Fig. 4. Time signal transmitter and amplifier used to retransmit time signals from the Naval Observatory, Washington, D. C.

to the antenna in such a manner that the frequency is determined by the constants of this tank, or dummy circuit. The oscillator uses one tube (UV-208) which is operated at reduced output. It is shown in the right center of the illustration. The modulating system employs five tubes (UV-206) and the plate method of modulation is employed.

People listening to a broadcast program do not realize the extreme care and accuracy that must be used in order to furnish them with a well worked out and transmitted program. Before the station opens, the staff is all on hand, and all clocks are checked to the second, as the studio where the actual performers sing or talk is located at a distance from the control and transmitting room and no mistakes as to time can be allowed. Before the actual operation of the station, the power men throw the complete assembly of operating apparatus to a dummy antenna and carefully check all readings. Then the apparatus is switched on the antenna, and a signal from the power house (located at distance of 3,000 feet from the operating room) tells the operators that everything is in readiness from an operating standpoint. When the program is started, the men at the power house listen in and tell the operators and the man in charge of the studio whether the modulation and signals are perfect; if not, they are immediately corrected. For every different kind of program a different type of microphone



(C. Photonews, N. Y.)

Fig. 5. Modulating and oscillating equipment. One oscillator and five modulating tubes are used. The oscillator is shown in the right center of the illustration and the modulators are directly to the left of the tuning system.

must be used and also the modulator system rechecked. This is done to conform with the amount of power necessary as it requires more power to transmit a vocal solo properly than it does to transmit a band or dance orchestra. Checking is constantly going on, and listeners at a distance cannot realize the activity that is necessary to transmit a program that they will receive perfectly.

WGY was the first station successfully to use the pallophotophone in the re-transmission of talks by famous persons. The first test on this marvellous device was heard and recorded in London, England, and Paris, while the person who delivered the address was many thousand miles from the actual transmitter.

Important Notice About Change of Address

Owing to the increase in circulation of RADIO WORLD and the fact that we have to go to press earlier, it is necessary that all changes in subscribers' addresses should reach us two weeks before date of publication. If you are going away, or contemplate changing address in the near future, please send in your change at once.—Subscription Dept., RADIO WORLD, 1493 Broadway, N. Y. C.

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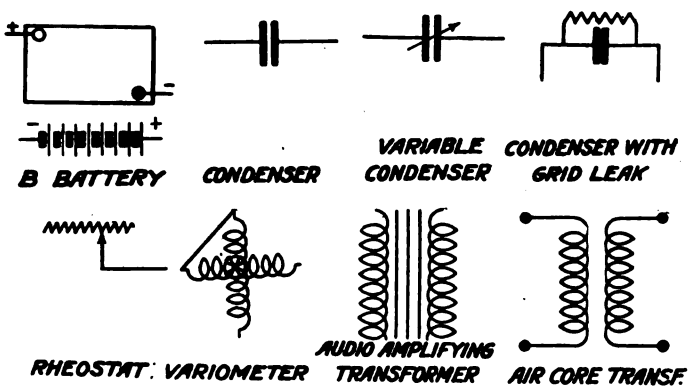
Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained in Plain Language for the New Radio Enthusiast

By Lynn Brooks

RHEOSTAT: An instrument used to reduce the amount of current flowing in a circuit. It is found in numerous forms, but the type with which we are concerned is that which varies the filament current. Generally it consists of a number of turns of german silver or other high resistance wire wound on a former which is circular or semi-circular in shape. Contact and variance of the resistance are made by means of a slider which passes over the wire. The rheostat sometimes takes the shape of a pile of carbon discs which are either compressed or released by means of a screw arrangement. When they are tightly compressed the resistance is very low and increases as the screw is released, reaching its maximum resistance when the carbon discs are as loose as possible.



Symbols used in drawings of radio apparatus to indicate the various parts.

VOLT: The measure of pressure or electromotive force, in an electrical circuit. Discovered by Count A. Volta, an Italian electrician. When measuring pressure, such as that caused by water flowing in a pipe, we would say that the pressure was so many pounds per square inch of surface. In electricity we measure the pressure in volts. A volt is the force necessary to cause a current of one ampere to flow through a circuit having a resistance of one ohm.

COULOMB: The time measure of "quantity" as related to electrical current. Discovered by C. A. De Coulomb, French scientist. It is the quantity of electricity that will pass a given point in an electrical circuit in one second. To measure coulombs it is necessary to measure the quantity of electricity delivered by a current having a strength of one ampere flowing for one second of time. Thus, a current of one-fifth ampere must flow continuously for five seconds to deliver a coulomb of electricity. A current of 10 amperes flowing through a conductor for one second would thus be 10 coulombs of electricity.

AMPERE: The measure of current flow in an electrical circuit. Discovered by A. M. Ampere, French scientist. An ampere is the current resulting from overcoming a resistance of one ohm in an electrical circuit under the pressure of one volt. Thus to find the amperage in a circuit it is necessary to divide the voltage by the resistance—the result being the amperage of the circuit.

WATT: The unit of electrical energy or power. It is the product of the voltage and current in a circuit when there is one volt and one ampere in the circuit. A horse-power equals 746 watts.

FORMULAE: For determining the voltage of a circuit use this formula: Voltage = Amperage multiplied by Resistance.

Problem: Known resistance 6 ohms. Known amperage two amperes. Find the Voltage. Amperage X Resistance = Voltage. 2 X 6 = 12 volts in the circuit.

For determining the amperage in a circuit use this formula: Amperes = Voltage divided by Resistance. Problem: Known voltage 12. Known Resistance 6 ohms. Find the amperage. Voltage ÷ Resistance = Amperage. 12 ÷ 6 = 2 Amperes in the circuit.

For determining the resistance in a circuit use this formula: Resistance = Voltage divided by Amperes. Problem: Known Voltage 12. Known Amperage 2. Find the resistance. Voltage ÷ Amperage = Resistance. 12 ÷ 2 = 6 Ohms resistance in circuit.

For determining Watts in a circuit: Watts = Volts X Amperes. Problem: Known voltage 12. Known amperage 2. Find the watts. Voltage X Amperage = Watts. 12 X 2 = 24 Watts in the circuit.

Radio Produces Piano Music from an Organ

By Jean Franklin

WHILE calling upon a prospective customer recently I saw a little child seated at an old organ and yet the music was that of a piano, which led me to ask questions. The big brother had purchased the old organ from a second-hand dealer for $5.00 and brought it home. Every one jeered at him and at his purchase, but "the way of the truly radiophan is hard"; so he kept his counsel and packed the old organ to his workshop. Here he removed carefully the scroll woodwork above the stops, set in his bakelite panel, and behind this installed his radio set.

The organ possessed a roll top and when the radio is not in use, he rolls down the top and secures it from dust and dirt. The set did not interfere with the mechanism of the organ in the least and he later had carved an aperture in the bottom beside the pedals, and here he has placed his loud speaker.

For my entertainment the sister, who was an excellent musician, was called in and she accompanied on the organ the voice that was singing via the radio. The happy little family also told me of sending in a request to sing one of their favorite numbers one evening. The request was complied with by the broadcasting station and the daughter accompanied the musicians who were playing so far away and the other children sang the same melody.

As I left the happy household, the little mother explained to me that previous to the advent of radio in their home, one daughter spent her evenings in a dance hall on the other side of town, her sons in a pool hall, and her husband at his store; but now the family hurried through supper and had their friends come in to hear the concerts.

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Pictures in Wide Variety Collected for Radio W

Captions by Ray Dougherty

(C. Kadel and Herbert)
Thousands of people have enjoyed listening to the organ recitals broadcast from Station WEAF every Sunday, but few have had a chance to see the monster organ. Here is shown the manual of the Skinner organ, which has 3,500 pipes, 44 stops and all horns, chimes, harps and full equipment. It cost over $50,000.00 to install. William E. Zeuch, noted organist, who has entertained thousands, is shown playing.

(C. Kadel and Herbert)
The speech amplifier control used to modulate the Skinner organ recitals before they are sent over the land wires to the operating room of WEAF. Because of the great volume of sound produced by an organ on the deeper tones it is necessary to regulate the apparatus extremely carefully if perfect reproduction is to be obtained.

(C. Keystone Views)
The boys of Dr. Bernardo's school, London, England, were recently presented with the set illustrated, to enable them to listen in on the Paris and New York broadcast programs. The photo shows Lady Torrington, its donor, listening in on one of the New York programs.

(C. Photonews, N. Y.)
Charles Ray letting his "pet houn' dog" listen in. "Whiskers" evidently doesn't think much of the soprano concert being broadcast and is just about to let the world know by a prolonged wail of protest against all soprano singers in general and that one in particular.

(C. Harris and Ewing)
First and exclusive illustration of Surgeon General Hugh S. Cumming, of the United States Public Health Service, in the radio room at Health Headquarters, Washington, D. C. This service is devoted exclusively to broadcasting health lectures on how to cure and prevent disease. The broadcasts are relayed through regular land wires to the Government broadcasting station at Arlington. These health talks are sent out twice a week, and arrangements are being made to increase the service until forty stations, covering the entire United States, are broadcasting them.

(C. W. T. Meyers)
Powell Crosley, Jr., President of the Crosley Manufacturing Co., Cincinnati, new equipment of Station WLW. The transmitter on his right is the new Electric control board. The speech modulator and amplifier is located directly of the operator, who has ample means of listening in on the program and cha tions to suit the needs.

...cted for Radio World Readers

...bert L. Dougherty

(C. Wide World Photos)

The proprietor of the "Butchers' Arms," Cross Land, Salford, England, has installed a complete receiver to keep his customers busy and buying. No, Oscar, the glasses do not contain root beer, as soft drinks are taboo in that particular atmosphere, even though they do use soft tubes as detectors. Who wants to be proposed for the next election as chief broadcaster and announcer in Great Britain? Now, one at a time—one at a time!

(C. Photonews)

Douglas Fairbanks shows how Robin Hood, the Merry Outlaw of the Twelfth Century, might—I said might—look if you could persuade him to get close enough to a modern Magnavox while a broadcast program was going on. They must be announcing a funny joke to make a busy man like Doug smile that way. Oh, well, radio does relieve once in a while. Who is it Doug? New York or London?

(C. Fotograms, N. Y.)

The last word in convenience has at last been made, thanks to radio. You can now reserve your seats in B. F. Keith's Royal Theatre, New York City, via radio. Miss Theresa Mardigan, operator, is always willing and ready to take your order over the air, and she can't talk back and say "sorry," either. Say, fans, notice the little old loose coupler all by its lonely? How well do I remember——!

...dicating the ...tt Western ... to the desk ... the condi-

(C. Harris and Ewing)

The latest code invention, which is capable of 11,881,376 changes by the mere twist of that little dial on the left-hand side of the machine. It is used by the U. S. Government instead of the bulky lead covered code books which were always such a temptation to the secret agents of other governments.

(C. Wide World Photos)

London has really gone radio mad, don't you know. They are now putting receiving sets on the private cars of the elite, so that they won't even miss a word while they are rushing to their offices.

(C. Kadel and Herbert)

"Let them that wants to dance themselves into a fit do so," is Mr. Harold Stein's motto. He is out after the "Radio Golf" endurance record for continuous reception. Mr. Stein has covered 30,000 miles in 24 hours' continuous listening in and claims to hold the record. Now, who is going to beat him? Send all records to Harold Stein, 1048 Madison Avenue, New York City.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR BUSY READERS

Dr. Lee de Forest, the well-known inventor, sailed for Europe last week.

* * *

An electrical cure for pneumonia is being perfected. The patient is shocked out of his congestion. Ordinarily, observes the Minneapolis Journal, he does not get the doctor's bill in time for the necessary shock.

* * *

The Heraldo De Cuba, a Spanish daily newspaper published in Havana, Cuba, will be the first newspaper on the island to own and operate a radio broadcasting station, which it expects to place in service about May 15.

* * *

The first baby born on the Government reservation at the radio station at West Sayville, Long Island—a boy—has been christened Francis Arthur by his parents, Mr. and Mrs. Robert A. Maxwell. The baby was born on Friday, April 13.

* * *

Action on regulation of radio communication is being discussed at the Pan-American Congress in session at Santiago, Cuba. The United States delegation is recommending the early convocation of a Pan-American Radio Conference in Washington.

* * *

In order to give advance information, WGY, the General Electric Company's broadcasting station at Schenectady, N. Y., a general outline of each week's programs will be announced on the preceding Friday at the close of the early evening concert—about 9:30 p. m.

* * *

Radio was employed to divert a patient's attention as an aid to local anaesthesia by surgeons at a New York hospital last week during an operation. The operation was successful and it was admitted that radio might in future become a factor in similar operations.

* * *

Floyd Charles Furlow, president of the Otis Elevator Company, died in New York City last week. He was educated at Georgia Institute of Technology and Worcester Polytechnic Institute. He was an early experimenter with X-rays, and built the first wireless apparatus in the South.

* * *

The results for the Einstein eclipse problem have just been deduced from the photographs secured at Walhal on the northwest coast of Australia on September 21 of last year by the William J. Crocker eclipse expedition from the Lick Observatory, University of California. These results are reported to be in exact accord with the requirements of the Einstein theory of relativity.

* * *

The Eiffel Tower will last another twenty-three years, according to engineers who have been examining its stability in consequence of a report that it was falling down. During the war the tower paid for itself many times over as a wireless information station controlled by the war department. It continues to be used as a wireless station, and broadcasts an evening concert and news bulletins that may be picked up at many points in Europe and on the Atlantic.

* * *

Earl Morrison, a parole violator, has been returned to the penitentiary at Joliet, Ill., following his capture by Freeport, Ill., police on a "radio tip." Morrison was paroled to a Chicago Heights business man last September. He left there a few days ago, saying he was going to Chicago. A description of Morrison was broadcast by Radio Station WOC, at Davenport, Iowa. A sergeant of the Freeport police station who was listening in copied Morrison's description.

* * *

"The concert was good and its reception perfectly clear and remarkably loud," says Louis M. Royal of Wrangell, Alaska, in a recent note to the operator of KFAE, broadcasting station at the State College of Washington, at Pullman, Wash. And L. L. Kannaly of KAN Ranch, Oracle, Arizona, responds with: "KFAE was appreciated in Arizona last night, and all hands on the KAN wish to thank you." As far east as Peoria, Ill., R. G. Coleman picked up the college with a short-wave regenerator set with two steps of amplification.

* * *

The practical use of radio, the airplane and modern birds-eye photography was strikingly demonstrated one day last week by the Marine forces at their main Atlantic Coast base at Quantico, twenty miles down the Potomac from Washington. Fire in a group of ten former Shipping Board wooden vessels was discovered. Through powerful field glasses, officers at Quantico, gazing down the Potomac, discovered the fire. They sent a marine aviator to investigate. He photographed the burning ship, sent the information by radio to Quantico, on the basis of which assistance was given to combat the fire, and the completed pictures of the fire were delivered in Washington in time to be printed in afternoon newspapers.

* * *

More than half a million people, it was estimated, last week heard the first radio debate on the prohibition question that has been held in this country. The debaters were Wayne B. Wheeler, general counsel of the Anti-Saloon League of America, and Colonel Ransom H. Gillett, general counsel of the Association Against the Prohibition Amendment. The arguments were broadcast from the studio of the American Telephone and Telegraph Company's station WEAF, where the debate was held. The point furthest away known to have received the discussion was a radio receiving set in Petersburg, Va. More than 150 questions were received by telephone, local and long distance, and hundreds of additional calls could not be handled.

Ten More Class A Stations Licensed

THE Department of Commerce has licensed ten more broadcasting stations to operate under Class "A" on specific waves in their respective districts.

Kansas, Nebraska, Missouri and Louisiana each received two stations, while Oklahoma and Texas got one each. Among the new stations listed below with their wave lengths, calls and power, are a daily paper, a church, two universities, a National Guard unit, and three electrical and radio concerns, showing an unusual distribution.

Although three of the stations received the same wave length, it will be noted that they are all in different districts and states, separated so interference will not be marked.

The ten new Class "A" stations which follow were licensed during the week ending April 28th:

Call	Station	Fre'cy. Kc/s	Wave L'gths. Meters	Power Watts
KFGM	Abilene Daily Reporter, Abilene, Texas.	1290	233	100
KFHF	Central Christian Church, Shreveport, La.	1130	266	150
KFGP	Cheney Radio Co., Cheney, Kansas.	1310	229	10
KFHI	Dixon, Charles V., Wichita, Kansas.	1340	224	20
KFGV	Heibreder Radio Supply Co., Utica, Neb.	1340	224	10
KFGC	Louisiana State University, Baton Rouge, La.	1180	254	100
KFFX	McGraw Co., The, Omaha, Neb.	1080	278	250
KFGJ	National Guard, Missouri 138th Infantry, St. Louis, Mo.	1130	266	100
KFHC	University of Oklahoma, Norman, Okla.	1180	254	20
KFHD	Utz Electric Co., St. Joseph, Mo.	1330	226	10

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Answers to Readers of Radio World

Would different rheostats in the Grimes reflex circuit be of any advantage? I am using different makes of tubes and they consume different values of current. Can this circuit be used on an outside aerial with a tuning inductance? Can the R215-A peanut be used in this circuit?—A. D. Turnbull, 57 Union Street, Sydney, N. S., Canada.

You can use rheostats in each tube filament circuit if you wish. The only reason that this was eliminated in the original circuit was that it made the controls simpler and that is what they are striving for. You can use this circuit in a tuned antenna circuit by connecting the secondary of your coupler across the two terminals where you normally connect your loop. You can use the tube you name with this circuit.

* * *

Kindly furnish me with a hook-up for using one WD-11 with a loop. I do not want to use any variocouplers or tuners unless it is absolutely necessary, as I intend to put it in a canoe and want to make it as simple as possible. Will the circuit enable me to tune in local stations and distant ones also? —L. Robinson, 535 West 189th St., New York City.

The hook-up you desire is given herewith. It will work on the canoe but its range is necessarily limited and you can not expect

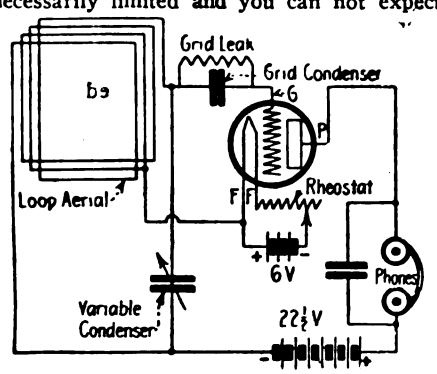

Diagram requested by Mr. L. Robinson. This circuit allows reception on a loop without the use of any inductances. The variable condenser is .0009 mfd.

to do any extensive long distance work with it. For local work it will be perfect. The loop should be about two feet square wound with litz or stranded wire. Ten turns will be about right. Use a clip for the third connection and do your rough tuning with that. You will then be able to incorporate all your apparatus in a box 6x6 inches, with the batteries separate.

* * *

Does it make any difference in the reception of signals if the antenna is hung loose, as long as the proper amount of wire is used?

I want to build a set using the peanut tube. What apparatus will I need?—Joseph P. Sims, 3826 Hennison Place, N. W., Washington, D. C.

The manner in which the antenna is erected does affect the reception. Be sure, however, that it will not swing and touch anything like telephone poles, electric wires, high tension lines or tin roofs. It will allow better reception if it is strung tightly.

The apparatus you will need is a tuner, condenser, both A and B batteries, variable condenser, telephone condenser, rheostat, socket, phones, antenna wire, and insulators.

* * *

Our local dealer claims that the U. V. 201A cannot be used for radio frequency. I have heard many reports to the contrary, but wish to find out definitely before constructing my set. Can they be used with the Acme R2 transformers? Are they good detectors? Are they good amplifiers? I wish to do away with my present set and install a one step radio detector and two stages of audio frequency. What bulbs may I use? I have 201A. My antenna is 70 ft. of wire strung around the picture moulding and with this I can only receive WJZ and other local stations. Does it matter if the power lines for my house are on a level with my antenna? Would this tend to decrease my distance?—Emil Nyldert, 389 George St., New Brunswick, N. J.

You have been misinformed. These tubes will work with radio frequency. They are perfect detectors and amplifiers. They will work in any circuit as either audio-frequency amplifiers, detectors or radio-frequency amplifiers. The transformer you mention is O. K. for use with this tube. You may use the 201A tubes in the circuit you mention. There may be a slight absorption noticed when such an antenna is installed, but if the wire is insulated it should not prevent you from receiving distant stations if your receiver is a tube set. Have it well insulated and do not run it near metal such as beams or posts. Good results have been achieved using a wire strung around the moulding such as you describe.

* * *

I have constructed the one tube super-circuit described by W. S. Thompson on page 9 of Radio World *for March 17. I have used the same values specified and hooked it up as shown but cannot get anything but a loud hum like that of a generator. What can my trouble be and how can I remedy it? —F. H. Flood, Chelsea, N. Y.*

The fact that you get a loud hum seems to suggest the fact that you have an open connection at some point in your circuit. Go over your wiring very carefully, examining all the connections and testing out the honeycomb coils. It may be that there is a broken connection in the honeycomb and that would cause it. See that your tube is making good connection on all the contacts. Watch the connections on your jacks and examine your variometer to see that there is no open connection in it. Rewire your set, being sure that you follow the diagram exactly. Look at all your fixed condensers and test them for a blown condenser as this might also be the cause. Mount the coils at right angles to one another. Examine the honeycomb mount to see that it is making good connection all around. This hum should not be present if the set is correctly wired and all connections soldered and no open line exists.

* * *

In the Anniversary Number of Radio World *you state in connection with the constructional article on a variocoupler, that a bank wound coil will transform this tuner into a multi-wave tuner. Where can I obtain information on this type of winding?—Joseph M. White, 2731 W. Silver Street, Philadelphia, Pa.*

If you will refer to Radio World for March 10, 1923, you will find an article on bank winding and the methods used in making bank wound coils on page 8 in an article by Arthur S. Gordon. It is very comprehensive and the drawings illustrate it clearly.

* * *

Kindly give me the diagram of the Reinartz circuit and also some information on the coils.—J. A. Thorne, 37 Riva Ave., Milltown, N. J.

If you will refer to page 23 of Radio World for January 13, 1923, you will find a circuit diagram of the receiver you mention, as well as a complete description of how to wind and tap the coils.

* * *

Can I use the two High-Mu audion tubes in place of the regulation U. V. 201 tubes in the reflex circuit described by W. S. Thompson? Can any radio-frequency transformer be used with these tubes?—F. H. Ameel, 88 Grand Ave., Mt. Clemons, Mich.

You can use these tubes in this circuit with success. You can also use any radio-frequency transformer, but it is better to use the Meyers as it is constructed for use with those tubes and calculated to the internal characteristics of the Meyers tubes.

* * *

Kindly give me a hook-up for the connection of a series-parallel switch in the antenna

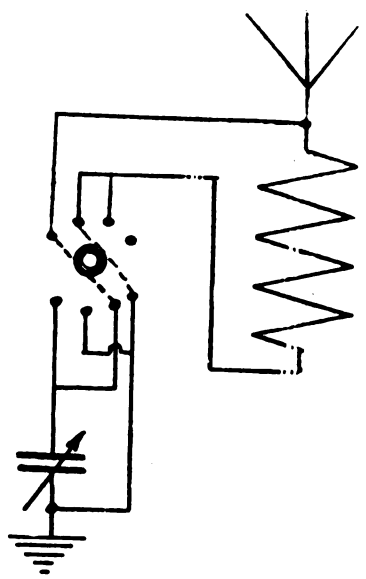

Diagram illustrating the connections on a series-parallel switch in the primary circuit of a receiving set.

circuit of a set.—Adolph Finender, 23 Vine St., Philadelphia, Pa.

The hook-up you desire is given herewith.

* * *

Are the French detector and amplifier tubes any better than the 216A, Meyers and VT 1 and 2 in the "super" circuit?—Wade E. Marshall (no address).

We do not compare the relative advantages of apparatus in this column. However, you will make no mistake in using American apparatus.

* * *

Enclosed find a drawing of the location of my antenna with reference to high tension lines, two branches of the Long Island railroad and power house. I get a continual hum, like the hum of a generator. Can you suggest any way to eliminate it?—L. E. Lowey, c/o New York Telephone Co., New Your City.

From your diagram you seem to be surrounded on three sides by power lines and leads from the power house. We cannot suggest any method outside of using a filter circuit such as described in Radio World for April 28, 1923, by C. White, or hooking-up a filter circuit such as described in Radio World for January 20, 1923, page 20, in answer to a question much the same as yours. You are in a very difficult position as regards clear reception, being surrounded in such a manner by power lines.

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Some Real DX Records You Can Shoot At

Captain Halsey Reports 59,190 Miles in 12 Hours 30 Minutes

From Captain J. H. Halsey, S. S. "El Cid," Southern Pacific Steamship Lines, Pier 40, N. R., N. Y. C.

NOTING some DX Nite Owls' records in your interesting journal I decided to send mine in. I keep a log of each station, as well as what they are sending; how I received it and the exact place I am at the time, as I change my position every day, running between New York and Galveston, Texas. In all I have logged 164 different stations since January 4, 1923. I am using a variation of the Flewelling circuit, with two steps, but never use second step, as ship's vibration causes distortion and rattling.

The following stations were heard on March 23-24-26 in 3 hours 30 minutes time: WKAQ, Porto Rico, 1,350 miles; WOR, Bamberger's, 1,250 miles; WGY, Schenectady, 1,350 miles; KDKA, Pittsburgh, 1,050 miles; WEAF, New York Telephone, 1,264 miles; WDAF, Kansas City Star, 855 miles; WBAP, Fort Worth Star-Telegram, 615 miles; KSD, St. Louis Post-Despatch, 775 miles; WDAO, Dallas, Texas, 580 miles; WHB, Kansas City (Sweeny's Auto School), 855 miles; WBZ, Springfield, Mass., 1,375 miles; WOS, Jefferson City, Mo., 780 miles; WEAY, Iris Theatre, Houston, Texas, 575 miles; WWJ, Detroit News, Detroit, 1,090 miles; WHAS, Louisville, Ky., 760 miles; WSY, Birmingham, Ala., 420 miles; WDAJ, College Park, Ga., 500 miles; WFAA, Dallas, Texas, 580 miles; WPA, Fort Worth Record, 615 miles. Total 16,429 miles.

(March 24—Off Tortugas, Fla., 4 hours 20 minutes.)

Belge, Honduras, Tropical. Radio Corp., 600 miles; WDAJ, College Park, Ga., 625 miles; WGM, Atlanta Constitution, Atlanta, Ga., 620 miles; WHAB, Galveston, Texas, 700 miles; WJZ, Waldorf-Astoria, New York, 1,250 miles; KSD, St. Louis Post-Despatch, 1,100 miles; WOC, Davenport, Ia., 1,250 miles; WBAP, Fort Worth Star, 1,035 miles; KFI, Los Angeles, Cal., 2,295 miles; WFAA, Dallas, Texas, 1,000 miles; WIP, Philadelphia, Pa., 1,175 miles; KWH, Los Angeles, Cal., 2,295 miles; WSB, Atlanta Journal, Atlanta, Ga., 620 miles; WDAF, Kansas City, Mo., 1,250 miles; telephone conversation between Catalina Island and San Pedro, 2,275 miles; WHB, Kansas City, Mo., 1,250 miles; WEAF, New York, 1,250 miles; WCAY, Wilwaukee, Wis., 1,375 miles; WHA, Madison, Wis., 1,385 miles; WDAL, Jacksonville, Fla., 425 miles. Total, 25,080 miles.

(March 26—200' Southwest of Cape Hatteras, 4 hours 40 minutes.)

WEAF, New York, 625 miles; WOR, Bamberger's, 616 miles; WGY, Schenectady, 760 miles; WBAV, Columbus, Ohio, 575 miles; WHAZ, Troy, N. Y., 760 miles; WDAV, Muskogee, Okla., 1,050 miles; WSY, Birmingham, Ala., 575 miles; WOS, Jefferson City, Mo., 975 miles; WOO, Philadelphia, Pa., 550 miles; WDAA, Nashville, Tenn., 600 miles; WLW, Cincinnati, Ohio, 650 miles; WWX, Washington, D. C., 415 miles; WJAZ, Chicago, Ill., 850 miles; KDKA, Pittsburgh, Pa., 550 miles; WJZ, New York, 625 miles; WGM, Atlanta, Ga., 390 miles; WDAP, Chicago, Ill., 850 miles; WOC, Davenport, Ia., 970 miles; WDAJ, College Park, Ga., 400 miles; WDAF, Kansas City, Mo., 1,075 miles; WDDR, Philadelphia, Pa., 550 miles; WBZ, Springfield, Mass., 710 miles; KSD, St. Louis Post-Despatch, 820 miles; WBAP, Fort Worth Star, 1,250 miles; WSB, Atlanta, Ga., 390 miles. Total, 17,681 miles. Grand Total, 59,190 miles in 12 hours 30 minutes.

My aerial is one single wire between trucks of each mast, about 300 feet long, entirely separate from ship's aerial.

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

An Old Friend Came Out of His Shell

From J. A. Gillem, Piqua, Ohio.

I HAVE been a reader of RADIO WORLD since your first issue; and, being interested in the DX Nite Owls' page, I thought I would send in my record for three nights.

Station Call	City	Signals
	February 23, 1923	
WDAF	Kansas City, Mo.	Fair & Clear
WGM WSB	Atlanta, Ga.	" " "
WBZ 1SAB	Springfield, Mass. (Testing)	" " "
WOR	Newark, N. J. (Transatlantic)	" " "
KYW	Chicago, Ill. (Midnight Show)	" " "
KDKA	East Pittsburgh, Pa.	" " "
KHJ	Los Angeles, Cal. (Road Conditions and Music)	Weak
WGY	Schenectady, N. Y.	Fair & Clear
WMAQ	Chicago, Ill.	" " "
WHB	Kansas City, Mo.	" " "
KSD	St. Louis, Mo.	" " "
WBAP	Fort Worth, Texas	Weak
WHAZ	Troy, N. Y.	Fair
WDAJ	College Park, Ga.	"
WIAO	Milwaukee, Wis.	"
	February 24, 1923	
WHAS	Louisville, Ky.	"
WOC	Davenport, Ia.	"
WMC	Memphis, Tenn. Atlanta, Pittsburgh, Newark and Kansas City	Loud
WLK	Indianapolis, Ind.	Loud
WLW	Cincy, O.	"
WLW	Cincinnati, O.	"
WCAH	Columbus, O.	Fair
WGC	Des Moines, Ia.	"
WDAC	Chicago, Ill.	"
WGV	New Orleans, La. (11:50 p. m. C. T.)	"
WHA	Madison, Wis.	"
WOAI	Webster Grove, Mo. (12:14 p. m. C. T.)	Weak
WPAL	Columbus, O.	Loud
WSY	Birmingham, Ala. (1:10 a. m. C. T.)	"
	February 25, 1923	
WJZ	Newark, N. J.	Loud
WHAS	Louisville, Ky.	"
WWJ	Detroit, Mich.	"
WLW	Cincinnati, O.	"

Using a W. T. No. 501 tube I duplicated eight stations on March 4, and, on March 10, all the above named stations, adding 9XW. I am using a scientific tuner, 23-plate variable condenser, GA grid condenser and a W-D 11 tube, 45 volts on the plate and 1½ volts filament. The tuner is a home-constructed one; the signals are loud, and I am using one tube. I also have a variocoupler instead of the tuner, single-circuit regenerative. It is mounted on the same panel. Brandes superior phones are used. My aerial is 95 feet long, 25 feet high at free end, and 20 feet at the lead-in.

All 'Board! Chicago and All Points West! 'Board!

From Henry A. Brown, 2768 Delaware Ave., Buffalo, N. Y.

In the March 17th issue of RADIO WORLD my attention was directed to Mr. Gordon's hook-up. It has been my intention to write you regarding my results obtained with this little wonder, but have been waiting till California was heard! (from Buffalo, N. Y.). The nearest approach is Butte, Mont. The directions were copied as to panel, etc., but a separate 3-plate vernier was inserted under the condenser, moving that instrument up slightly. A variable grid leak and condenser (Freshman) was also used to good advantage. Not having a W-D 11 I used a U. V. 200.

The first station in was Kansas City, WHB, good and loud. I must admit that I was skeptical, having tried many hook-ups that were supposed to "fill the room laying the phones on the table" or "blowing hats off." You know what I mean. I wish to add my praise and thanks for your contribution to us poor dubs on the side lines like myself who do not know anything about this game until the other fellow tells us. Attached you will find a list of stations heard—by that I mean, *at least one piece clear* and not just sign offs—not having a map handy I do not know what mileage this represents but is a good record for 5 evenings' work.

I live one mile from WGR, Fed. Tel. & Tel., and can tune them out at will. One evening Toronto, Davenport, Philadelphia, Newark, Springfield, Mass., and New York City came in. Two pairs of phones are used, and a friend of mine witnessed the above. I can't tell you exactly what he said, but suffice to say it was very expressive.

WGF—Des Moines, Ia.
WGY—Schenectady, N. Y.
WHAM—Rochester, N. Y.
WMAK—Lockport, N. Y.
WHAZ—Troy, N. Y.
WEAF—New York City.
WBZ—Springfield, Mass.
KDKA—Pittsburgh, Pa.
WOR—Newark, N. J.
WJZ—Newark, N. J.
WHAS—Louisville, Ky.
WGM—Atlanta, Ga.
WSB—Atlanta, Ga.
WDAJ—Atlanta, Ga.
KYW—Chicago, Ill.
WDAP—Chicago, Ill.
WLAG—Minneapolis, Minn.
WLW—Cincinnati, Ohio.

Said hello, several times then Winnipeg, Canada.

CFCA—Toronto.
WSY—Birmingham, Ala.
WBT—Charlotte, N. C.
WHB—Kansas City.
WDAF—Kansas City.
WBAP—Fort Worth, Tex.
WFAA—Dallas, Texas.
WOAI—San Antonio, Texas.
WOS—Jefferson City, Mo.
WIP—Philadelphia, Pa.
WOO—Philadelphia, Pa.
WOC—Davenport, Ia.

WMC—Memphis, Tenn.
WMAQ—Chicago.

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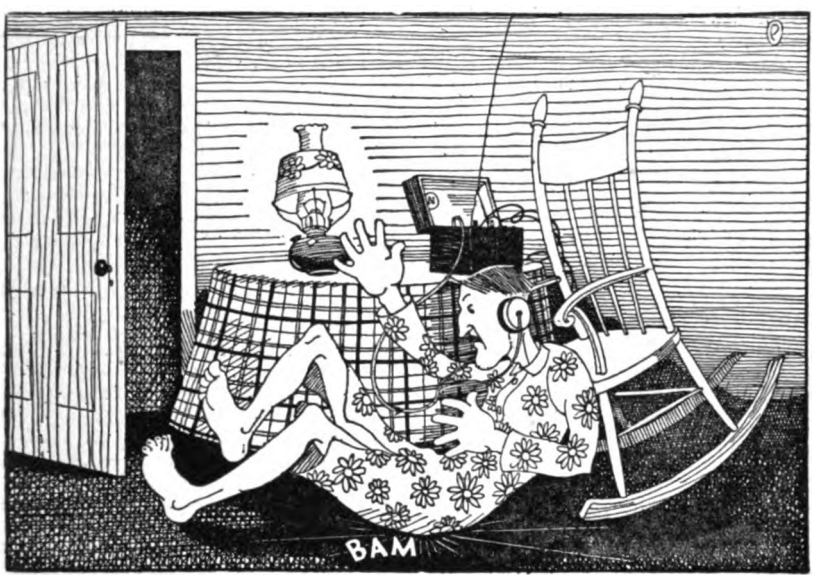
Broadcast Bill's Radiolays

By William E. Douglass

YOU know, the other night I simply couldn't go to sleep an' gosh I tried most every way. I even counted sheep. An' when I passed a thousand they kept jumpin' just the same. Those last three cups of coffee must uv been what wuz to blame. So gently I crept out of bed as quiet as could be n' went down stairs to smoke an' read till maybe two or three, at which time ol' man Morpheus might not be quite so shy. I'd heard of others tryin' it an' 'lowed 'twuz worth a try. I pulled a chair up by the fire but 'fore I lit the light thinks I, "Some station's sending even at this time of night." So you might say suitin' action to the word I got my set an' I clamped those rubber earmuffs on to see what I could get. I listened to an orchestra in Dallas for awhile an' say it wuz a dandy playin' music just my style. I could hardly keep my feet still when they played "I'm All Alone" an' that chap that played the saxophone sure got a wicked tone. Well, almost without thinkin' 'fore I knew what I wuz sayin' I yells "give us one more encore" an' the boys kept right on playin'. 'Course I don't suppose they heard me but one party did I know an' I soon received a message which wuz not by radio. There wuz Min up on the landin' with her night cap on her head an' her message wuz as follows, "You march right up here to bed." "I'll be with you in a minute, dear. Did I disturb your rest?" I answered her real gentle an' just then frum way out west, I picked up another station which was sendin' out a speech on the Famous Men of Russia, an' What They Have Tried to Teach. I'll admit he knew his subject but the next thing that I knew I wuz travelin' in an aeroplane across an ocean blue. As I looked off in the distance I could see a stretch of sand an' I figgered that had ought to make a dandy place to land. All at once I started fallin', droppin' straight down through the air. When I hit it was surprisin' I had fell out of my chair.

(Copyright, 1923, Westinghouse Electric & Manufacturing Company.)



"When I hit it was surprisin'—I had fell out of my chair."

Radio Successfully Penetrates Mine Shaft

AN interesting and highly successful experiment, recently carried out by the members of the Radio and Research Club of the Springfield, Ill., High School, was radio communication between members of the club located in a mine and other members above, at various places around the city.

It has always been a moot question in the minds of radio experts whether successful communication could be carried on between men far below the earth and others at a distance on the surface. The members of the club went down 250 feet with portable apparatus and, under the leadership of A. B. McCall, the faculty adviser of the club, started in to call the world above. The excited listeners at the top of the shaft continued to communicate with them until notice came that another member, located at his home in Springfield, had also heard and answered the signals.

Mine officials from all over the country are interested in the outcome of the experiment because of the fact that it will prove invaluable in mine rescue work in aiding entrapped miners. Rescue crews will be able to keep in constant touch with one another and the surface through the aid of simple and portable apparatus.

Radio Corporation Orders Employees to Become Naturalized Citizens

GEN. J. G. HARBORD, president of the Radio Corporation of America, New York City, has issued an order that all unnaturalized employees of the company must become American citizens. Of the 1,100 employees it is said that only 76 are aliens and that these are nearly all Canadians.

"It is only reasonable," Gen. Harbord is quoted as saying, "that those who are enjoying the privileges and advantages of inhabitants of this country should assume the responsibilities of citizenship. Our charter requires that all elective officers be American citizens, and we are extending this requirement to include all our organization. Any who do not want to be naturalized are at liberty to leave."

Why Magnavox *is* the Reproducer Supreme

OFFICIAL tests with the oscillograph prove that the Magnavox electro-dynamic receiver reproduces incoming wave forms with maximum accuracy.

The Magnavox can be used with any receiving set—the better the set, the more Magnavox can do for you.

When you purchase a Magnavox you possess an instrument of the very highest quality and efficiency.

R2 Magnavox Radio with 18-inch horn
(as illustrated)

This instrument is intended for those who wish the utmost in amplifying power; for clubs, hotels, dance halls, large audiences, etc. It requires only .6 of an ampere for the field. Price, $60.00

R3 Magnavox Radio with 14-inch horn

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R2. Price, $35.00

Model C Magnavox Power Amplifier

For use with the Magnavox Radio and insures getting the largest possible power input.

2-stage, $55.00
3-stage, $75.00

Magnavox products can be had of good dealers everywhere.

THE MAGNAVOX CO.
Oakland, California
N. Y. Office: 370 Seventh Ave.

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Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested through the Service Editor of RADIO WORLD, by the following:

Wm. Marshall, 100 Randolph Ave., Jersey City, N. J.
Wesley Gillette, Schuylkill Haven, Penn.
B. Hennessy, 30 Fifth Ave., New Rochelle, N. Y.
A. V. B. Evans, 98 Ascan Ave., Forest Hills, Long Island, N. Y.
Excelsior Book & News Co., Box 232, Aberdeen, Md. (Retailers.)
Clyde E. Reed, Norfolk, Neb.
Carl E. Ray, Grass Valley, Ore. (In market for receiving set.)
Leo Zittman, 1 Stack Place, Brighton Beach, Brooklyn, N. Y.
Martin V. Smith, Fort Bayard, New Mexico.
Cecil Gee, 716 Washington Street, Portsmouth, Ohio.
Homer S. Reece, Rural Route 2, Box 112, Mt. Park, Okla.
C. A. Storer, 33 Pearl Street, Springfield, Mass.
P. W. Fitzkee, 2735 East Sixth Street, Tulsa, Okla. (Has trouble getting good parts.)
A. C. Cavender, 510 South Pine Street, Hope, Ark.
J. W. McLean, 8103 Maryland Avenue, Cleveland, Ohio. (Wants to become a distributor.)
L. S. Hillegas-Baird, Business Manager, The Milwaukee Radio Amateurs' Club, 229 Ninth Street, Milwaukee, Wis.
Chester R. Lytle, Hitchcock, S. D. (Consumer.)
Leroy Stapleton, Box 69, Saxton, Pa.
Robert Donaldson, 1010 First Avenue, Seattle, Wash.
T. J. Tronson, 34 Seventh Avenue, Fond du Lac, Wis.
W. V. Wood, 347 Ralston Street, Reno, Nev.
Radio Bug House, George W. Perkins, Thomson, N. Y.
J. R. Young, 653 Pacific Highway, Cottage Grove, Ore.
P. E. Lust, 1146 Twelfth Street, Portsmouth, Ohio.
E. K. Anderson, 916 Greene Avenue, Brooklyn, N. Y.
T. R. Bailey, 113 North Washington Street, Platteville, Wis.
A. O. Pearce, P. O. Box 625, Palatka, Fla.
Righto Radio Co., C. T. Ayres, Manager, 10758 Indiana Avenue, Chicago, Ill. (Wants dealers' prices.)
Donald H. Race, 89 Boyd Street, Stapleton, N. Y.
Isaac Gruber, 2025 Arctic Avenue, Atlantic City, N. J. (Is starting a radio salesroom.)
D. A. Haggin, Stillwater, N. Y.
Charles A. Smith, 713 Oberlin Avenue, Lorain, Ohio.
Edward W. Young, 2628A Bermar Street, St. Louis, Mo.
Fred B. Gleason, Jr., Taft School, Watertown, Conn.
Frank J. Mapps, 319 Pearl Street, Brooklyn, N. Y.
T. R. Goldsborough, Assistant Examiner, Division 16 (Radio), U. S. Patent Office, Washington, D. C.
Webster C. Patterson, 392 South River Street, Wilkes-Barre, Pa.
Will H. Quinn, 915 Davis Avenue, Pottsville, Pa.
E. E. Ridings, Blytheville, Ark.
Francis McCarthy, 514 Center Street, Middleboro, Mass.
Huron H. Smith, Public Museum, Milwaukee, Wis.
G. Haskell Blanchard, 111 Manchester Road, Schenectady, N. Y.
Walter J. Gray, 5145 Terry Avenue, St. Louis, Mo.

Duke of York Gets an American Radio Set

A LETTER recently received from a large manufacturer of radio goods—The Eagle Radio Company, 210 Central Avenue, Newark, N. J.—shows how completely American radio manufacturers have captured the field. The letter states in part:

"It might interest the readers of your magazine as a news item to note that the following Associated Press report was received on April 26, the date of the Duke of York's wedding, relative to the Eagle Portabloop receiver set:

"'One of the most unique and most appreciated gifts received by the Duke from the United States is a powerful receiving set built upon a mahogany tea wagon.'"

It is the belief that this radio receiver was the only one received by the Duke as a wedding present. It was purchased from one of the Eagle company's New York City dealers—Kellogg & Bertine, 631 Madison Avenue.

A High Grade, Low Price Grid Leak

A WELCOME accessory to the field of radio parts, and one that will be duly appreciated by fans who construct their own sets, is a cheap and extremely well made grid leak manufactured by the Airex Company, 237 Centre Street, New York City. In appearance the leak somewhat resembles an overgrown paper condenser, with a small scale and pointer on it. It is constructed of thin fibre, and is extremely reliable over a range of from 0-10 megs. which gives enough latitude for the most finicky builder. It is neatly made, and, as there are no composition parts to chip and break, and is extremely thin, it should meet with a great reception by the fans. It sells for 25 cents, which is a revelation in these days of high prices.

An Efficient Portable Regenerative Receiver

CHARLES A. PEZET, 46 West 65th Street, New York City, has perfected a portable receiving set that actually deserves the name. The dimensions of the case are only 12¼ by 9½ by 4¼ inches, and the total weight is only five pounds.

But its portability is matched by the efficiency of the set. Mr. Pezet has based his circuit on the Armstrong triple circuit, using three Litz wound spiderwebs as tuning inductances for primary, secondary and tickler circuits. The set can be worked either on a WD-11 or UV-199 tube. A special feature of the set is an extra connection, with which it is possible to operate it with a ground alone or an antenna alone. It is claimed by the builder that this set has brought in stations hundreds of miles away and has tuned out local interference that has bothered larger, more bulky sets.

RADIO STOCKS

(Quotations as of May 2, 1923, furnished by Frank T. Stanton & Co., 15 Broad St., New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped...	5*	15*
American Marconi, Unstamped	$5	$7½
American Tel. & Tel.....	122	122½
Canadian Marconi	2½	3
Dubilier Condenser	11⅛	11½
English Marconi com.....	11	15
English Marconi pfd.....	11½	15½
Federal Tel., Cal.....	5	5½
General Electric	173	173½
Hennessy Radio Pub. 8% pfd.	9	11
Manhattan Elec. Supply.....	55	57
Marconi Int. Marine.....	7	9
Mackay Companies com.....	112	113
Radio Corporation com.....	3½	3⅝
Radio Corporation pfd.....	3½	3⅝
Spanish Marconi	1	3
Western Union	110	110½
Westinghouse E. & M.....	56½	56¾

*Cents per share.

Federal Tel. & Tel. Co.'s Guarantee and What Is Back of It

THE Federal Telephone & Telegraph Company, Buffalo, N. Y., one of the best known and staunchest manufacturers in the telephone and radio industries, recently adopted a guarantee, which is printed on a tag and attached to each of its products. It reads as follows:

"We hereby guarantee Federal Standard Radio Products to be free from all mechanical and electrical defects, and to function properly when installed in accordance with our authorized directions, and we agree to replace, at our expense, any unit or part which may prove defective."

As any guarantee is dependent upon the financial ability of the maker to live up to it, the following statement of the assets and liabilities of the Federal company should be of convincing interest:

BALANCE SHEET, JANUARY 1, 1923.

Assets

Cash	$124,259.98
Notes and Accounts Receivable	749,868.96
Real Estate and Inventory.....	2,439,442.77
Investments, Stocks and Bonds at par	7,272,433.71
Franchises, Patents, etc.....	523,761.35
Prepayments	124,739.07
	$11,234,505.84

Liabilities

Stock Issued	$7,282,750.00
Accounts Payable	73,925.98
Notes Payable	2,728,293.37
Accrued Accounts	27,130.39
Funded Debt	391,700.00
Surplus	730,706.10
	$11,234,505.84

RADIO WORLD congratulates the Federal company on this significant and forward step, which undoubtedly will be followed by others and do much to standardize radio equipment and stabilize merchandising conditions throughout the entire radio industry.

New Radio and Electric Firms

Electrical Home Needs Co., Cleveland, Ohio; L. P. Kearns, R. G. Latom, B. D. Zieve, A. Cline and F. P. Chapin.

Bat-Electric Service Co., 619 State St., Watertown, N. Y.

E. H. Freeman Electric Co. has removed to 10 Prince St., Trenton, N. J.

Electrical Supply & Equipment Co. will occupy a new four-story building at 278 Broadway, Albany, N. Y.

Service Electric Co. has removed to 116 Washington St., Binghamton, N. Y.

Reeservice Shop is the new name of Reeservice Music Shop, 108 Main St., Cambridge City, Ind. Increased radio business is reported.

Southern New York Electrical Supply Corp., 78 State St., Binghamton, N. Y. W. H. Hecox, E. C. Wehle and H. A. Yetter.

Electrical Merchandise, Inc., 225 Glenridge Ave., Montclair, N. J., J. E. Nestor.

Federal Radio & Electric Co., wholesale electrical supplies, 41 Park Ave., Paterson, N. J.

Niagara Falls Electric Supply Co., 215 Main St., Niagara Falls, N. Y.; A. W. Paltrovitch.

Northern Electric Construction & Fixture Co., Cleveland, Ohio; capital stock, $10,000; R. L. Davis, P. S. Graham, G. A. Robinson, G. Carter and F. Sellberg.

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Directors of Boys' and Girls' Summer Camps

FOLLOWING is a list of names and addresses of directors of boys' and girls' summer camps, each of whom should be a potential purchaser of radio sets for camp and vacation use. Additions to the list will be published in succeeding issues of RADIO WORLD:

R. C. Frank, 620 West 122d St., New York.
G. R. Frank, 192 Parkwood Ave., Columbus, Ohio.
Louis M. Fleisher, 1218 Walnut St., Philadelphia, Pa.
Samuel G. Friedman, 1422 North 16th St., Philadelphia, Pa.
Edward A. Carlson, 118 Coulter Ave., Ardmore, Pa.
Ralph I. Underhill, Scarsdale, N. Y.
Harvey C. Went, 1083 Noble Ave., Bridgeport, Conn.
Irving G. McColl, Hotel McAlpin, New York.
Jacob M. Ross, 575 West 172d St., New York.
Ephraim Weinstein, 455 Ft. Washington Ave., New York.
George A. Kohut., Ph.D., 220 West 87th St., New York.
Harry J. Kugel, Kohut School for Boys, Harrison, N. Y.
Edwin V. Spooner, Exeter, N. H.
Frank E. Poland, 22 Oak Terrace, Malden, Mass.
W. S. Cowing, 21 Carver Rd., Newton Highlands, Mass.
Henry Richards, Gardiner, Me.
Guy W. Chipman, 15 Clark St., Brooklyn, N. Y.
Mrs. E. D. Baylis, 1021 Ocean Ave., Brooklyn, N. Y.
Andrew I. Albert, 1728 Crotona Park East, New York.
A. A. Jameson, 615 Chamber Commerce Bldg., Atlanta, Ga.
Edward M. Healy, 227 Roseville Ave., Newark, N. J.
C. E. Allen, 19 Ricker Rd., Newton, Mass.
A. R. Webster, 1325 Cypress St., Cincinnati, Ohio.
Joseph I. Gorfinkle, Mount Vernon, N. Y.
C. E. Allen, 19 Ricker Rd., Newton, Mass.
Joseph C. Saltman, 1454 Grand Concourse, New York.
Mr. and Mrs. R. L. Marsans, 519 Second St., Brooklyn, N. Y.
A. E. Hamilton, Raymond, Me.
Mrs. F. T. Burdett, 239 Park Ave., East Orange, N. J.
Miss Mary E. Richardson, 69 Woodmont Ave., Mittineague, Mass.
Miss Margaret H. Schmidt, 128 Leicester St., Detroit, Mich.
Miss Edith A. Steere, Packard Rd., Ann Arbor, Mich.
Miss Edith P. Holt, 39 Fitch Pl. S. E., Grand Rapids, Mich.
Miss Winifred Schureman, 1780 Lyndale Ave., South Minneapolis, Minn.
Dr. and Mrs. J. Grant Quinby, Lakeport, N. H.
Mrs. Blanche Carstens, 523 Washington St., Brookline, Mass.
Mrs. N. S. Winchester, 31 East Haverhill St., Lawrence, Mass.
Miss A. R. Hazelton, 14 Billingham St., Somerville, Mass.
Miss Alice Hazelton, 14 Billingham St., Somerville, Mass.
Dr. Ann Tomkins Gibson, 6323 Lancaster Ave., Philadelphia, Pa.
Calvin Sargent, New London, N. H.
Miss Mary H. MacCracken, Mount Vernon Seminary, Washington, D. C.
Julia E. Lancaster, Newton Center, Mass.
Miss Lena Seitlen, 572 Blue Hill Ave., Roxbury, Mass.
Miss Rachel Rosnosky, 29 Richfield St., Dorchester, Mass.
Mrs. Morris Klein, 617 West 141st St., New York.
Mrs. S. Evannah Price, 40 High St., Springfield, Mass.
George W. Orton, 39 South 10th St., Philadelphia, Pa.
Ernest P. Roberts, 55 Hanson Pl., Brooklyn, N. Y.
B. B. Girden, 3805 Review Pl., New York.
C. Ward Crampton, M.D., 18 East 78th St., New York.
Wallace Greene Arnold, 81 Jane St., New York.
Robert Tindale, 31 East 71st St., New York.
Miss Esther Hamburger, 250 West 103d St., New York.
Miss Mildred Hamburger, 250 West 103d St., New York.
Miss Fanny G. Crenshaw, 919 Franklin St., Richmond, Va.
Mrs. N. B. Adams, 509 West 121st St., New York.
Mrs. Fannie L. Bernstein, 385 Ft. Washington Ave., New York.
Jacob Heniger, 230 West End Ave., New York.
Miss Effie Berdann, Hotel Wolcott, New York.
Miss Dora Weil, 2020 Eutaw Pl., Baltimore, Md.
Mrs. C. P. Towne, Woodland Park, Auburndale, Mass.
Mrs. M. Thorner, 2672 Boulevard, Jersey City, N. J.
Miss Emily H. Welch, 476 Norwood Ave., Buffalo, N. Y.
Robert A. Patterson, Kingswood School, Hartford, Conn.
D. H. Markham, University of Arkansas, Fayetteville, Ark.
Joy Pratt Markham, Fayetteville, Ark.
E. C. Offinger, 14708 Shaw Ave., East Cleveland, Ohio.
Ralph S. Pitts, 130 Grant St., Denver, Colo.
Tedford Cann, 2259 Loring Place, New York.
Emil Von Elling, New York University.
John H. Bruns, 153 E. 86th St., New York.
Frank T. Essig, 5 West 125th St., New York.
Miss Blanche Hirsch, 5 West 91st St., New York.
Miss Clara Altschul, 5 West 91st St., New York.
Miss Ethel L. Sargent, 58 Glenville Ave., Allston, Mass.
Miss Harriet M. Balcom, 58 Glenville Ave., Allston, Mass.
Miss Rose Sommerfeld, 225 East 63d St., New York.
Mrs. Bella Hirsch, 309 West 86th St., New York.
Ethel B. Mayall, Princeton, N. J.
Miss Alice H. Belding, Randolph-Macon Coll., Lynchburg, Va.
Wm. Gould Vinal, Rhode Island College Education, Providence.
Miss Beatrice A. Hunt, Holbrook, Mass.
Mr. and Mrs. I. Spectorsky, 232 West 112th St., New York.
Mrs. E. A. W. Hammatt, South Orleans, Mass.
Samuel Schlosberg, 11 Lathers Pl., New Rochelle, N. Y.
Albert Loewinthan, 227 Audubon Ave., New York.
Miss Mary D. Snyder, 362 S. Broadway, Lexington, Ky.
Miss Sara G. Blanding, 548 Central Ave., Lexington, Ky.
Mrs. Clara F. Liebman, 409 Edgecombe Ave., New New York.
Dr. Emma G. Wood, Box 416, Maplewood, N. J.

(To be continued)

U. S. S. "Guide" Wants a Chief Radio Operator

EDITOR, RADIO WORLD: The U. S. Coast and Geodetic Survey steamer "Guide" is outfitting and assembling a crew at the present time, and we are desirous of enlisting a Chief Radio Operator. The pay of this rating is $90 per month. The rating is equal to a C. P. O. in the United States Navy, but the man is not an officer. The man must enlist for a period of one year. The ship will probably go to the west coast of the United States in the late summer, and work on that coast thereafter.

We are desirous of getting a man who has had navy experience, preferably a man who was on minesweepers, as this vessel has the minesweeper radio equipment.

If you know of any men who would be interested in this position please refer them to me at the address below, and it will be greatly appreciated.

Respectfully,
K. T. ADAMS,
Executive Officer, U. S. S. "Guide."
West New Brighton, N. Y.

Wireless Expert's Kidnapped Son Sought by Radio

VERNER ALEXANDERSON, the six-year-old son of E. F. W. Alexanderson, chief engineer of the Radio Corporation of America, was kidnapped from his home at Schenectady, N. Y., on April 30.

News of the crime was almost immediately broadcast from Station WGY of the General Electric Company at Schenectady. Since then WJZ, the Westinghouse station at Newark, N. J., has also broadcast news of the child's disappearance. Both stations, as well as several others, have sent out detailed descriptions of the boy, and these have been picked up by many amateurs and police department officials.

Mr. Alexanderson has offered a reward of $1,000 for any clue to finding his son, and the city of Schenectady has offered another reward of equal amount.

When he was kidnapped Verner was playing in the yard of his home with his two sisters when a stranger approached. After engaging the children in conversation he offered to get a pair of rabbits for the boy, and sent the sisters for a box in which to put them. When the little girls returned the boy and the strange man had disappeared.

A number of fruitless clues have been followed. The broadcasting has been repeated several times since the kidnapping. The child was found near Theresa, N. Y., on May 3.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

CANADIAN ELECTRICAL ASSOCIATION, Montreal, Canada, June 21-23, 1923; Louis Kon, secretary, 65 McGill College Avenue, Montreal, Canada.

NATIONAL ELECTRIC LIGHT ASSOCIATION, New York City, June 4-8, 1923; M. H. Aylesworth, executive manager, 29 West Thirty-ninth Street, New York.

"MANY INQUIRIES—LARGE SALES—CONTINUE THE AD!" SAYS RADIO WORLD ADVERTISER

Frederick H. Pruden, Incorporated

Manufacturers Representatives Electrical and Radio Apparatus
Lerner Building, Journal Square, Jersey City, N. J.

Editor, Radio World:—We are very pleased to inform you that our advertising through your medium has resulted in the largest number of inquiries received from all other advertising mediums.

These inquiries have resulted in a large number of sales. They have come to us through your paper from India, France, Cuba and Canada. No one knows where the next one will come from, perhaps from Japan or China.

It is our belief that your paper, although a comparatively new one in the radio field, compares favorably, if it does not excel, some of the older publications. It is our intention to continue advertising in every issue.

Yours very truly,
Frederick H. Pruden, Incorporated
(Signed) F. H. PRUDEN, President

April 14, 1923

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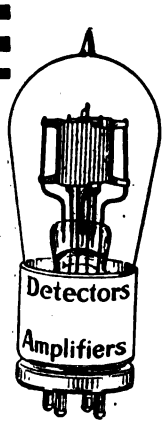
We Advertise Only the Best Tubes Made
GUAR. 1½ VOLT TUBES
$6.50 Detector and Amplifier for dry cells.
Fits standard pocket $4.75
5.00 Detector Tubes, guar. 2.75
6.00 Amplifier Tubes 3.50
1.50 22½ Volt B Battery ..... .79
To avoid delays check items and total amount.
Dealers:—Write for Attractive Discounts on Above
B. B. RADIO COMPANY
2202 Mermaid Ave., Dept. W.4, Brooklyn, N. Y.
All Deliveries Made Within Two Days

SELECTO-Jr.
180° Variocoupler
Built for Results
Has no solid dielectric in Rotor.
Rotor built of self-supporting pancake coils. Lowest possible resistance, resulting in increased selectivity.
Requires only 2½" width on panel, no more than dial. Range, 200-700 meters.
$4.00 each, postpaid
Send P. O. or Express Money Order
J. E. TAYLOR
282 N. Calvert St., Baltimore, Md.



GUARANTEED
REPAIRS
Broken and Burned Out
VACUUM
TUBES
W.D.-11 not accepted for repair
Your dealer should know, but if he does not, send direct to
HARVARD RADIO LABORATORIES
Boston 9, Mass.
Tubes returned parcel post C. O. D.

We Recommend For Investment
HENNESSY RADIO PUBLICATIONS CORP.
8%
PREFERRED STOCK
(Publishers Radio World)
Complete details sent free upon request
Frank T. Stanton & Co.
Specialists in Wireless Securities Since 1917
35 Broad St. New York
Tel. Broad 8619-1670-3962

The Associated Radio Industries of St. Louis

AN association of radio dealers, jobbers, manufacturers and manufacturers agents has been formed in St. Louis, Mo., for the purpose of co-operation and good fellowship. The officers are: President, C. H. Wilson, Manhattan Electric Supply Co.; vice-president, W. E. Fuetterer, Fuetterer Battery Service Co.; Secretary, W. E. Kuhn, Security Radio and Auto Supply Co.; treasurer, R. W. Lawrence, Lawrence Radio Corporation. The directors are: W. Saltmarsh, The McGraw Co.; H. B. Engel, Sobeig-Engel Co.; C. Brunswick, Brunswick Electric Co.

The association has adopted this slogan: "Buy Satisfactory Radio from Dependable Dealers." Members will be supplied with a large card bearing the emblem and slogan to be placed in their stores and will run co-operative advertising in the local newspapers continuously. It is also the intention of the association to take charge of all future radio shows. The cost of membership is $10 initiation and $10 yearly dues.

Partial Program of WGY

THE Chamber of Commerce of Watervliet, N. Y., will provide the concert for Thursday night, May 10, broadcast from WGY, the General Electric Company's station at Schenectady, N. Y. The program will include orchestral and vocal quartet selections as well as solos, and Colonel W. I. Westervelt, U. S. Commandant of the Watervliet Arsenal, will talk on "The U. S. Army Gun Plant." A special feature will be a chime selection by Ernest A. Meneely. The chime set to be used is the only one of its kind and was recently turned out by the Meneely Bell Foundry.

During the early concert Friday night, May 11, J. C. Warner will give a talk on the UV-201-A and UV-199 tubes. At 10:30 o'clock Friday night, the WGY Players will present Langdon McCormick's play, "The Storm." The WGY Players will be assisted by Harry Hollingsworth and Nan Crawford, Van Curler Players.

Saturday evening a program of dance music will be broadcast from Cain's Dance Castle.

Why His Set Didn't Receive

HE was a bumptious radio fan. He could pick up St. Louis, Chicago, San Francisco, according to the New York "Sun." He was never tired of telling particularly the meek little man who owned a cheap amateur set what wonderful times he had listening in. "You ought to get a real outfit," was his stock expression.

One night the meek little man knocked on the door of the bumptious one. "I can't seem to pick up the Blank Orchestra," he explained apologetically. "I'm wondering if it's static or something like that."

"Nothing of the kind. It's just your bum outfit. Come on in and we'll pick it up on mine."

But the bumptious one didn't have any better luck than his humbler neighbor. He grew wrath. "This set's no good. I'll get another. I'll throw this one out!"

"Would—would you sell it to me?" asked the meek one timidly.

"Sell it to you! Take it!"

The meek little man departed rejoicing in his good luck.

And now the bumptious one is off radio for life. His outfit was perfectly good; there was no atmospheric disturbance; the Blank Orchestra was on strike that particular night.

Fifty-two issues for $6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

Good Bye Aerials!
So Long Static!

(Pat. Pending)
Replaces aerials, loops, electric light plugs, etc. Eliminates lightning dangers. Reduces STATIC and other interference. Brings clearer signals and truer tone. Works on all standard vacuum tube sets.
Postpaid, Anywhere, for $5.00
Satisfaction Guaranteed, or Money Refunded.
Dealers: Write for our proposition.
Short Cut Radio Corp.
243 West 54th St. New York
Makes Your Set Portable

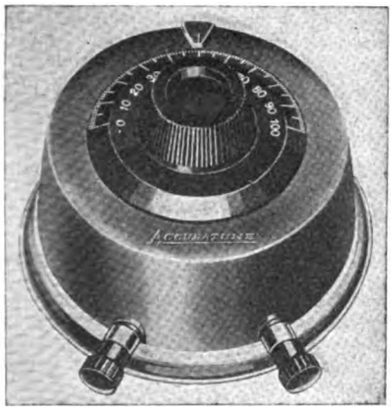
SHELTONE
Loud Speaker
With Special
Nath. Baldwin
Type C Headset
Correct in
PRINCIPLE
PERFECT
RESULTS

When you sit back to enjoy the broadcast program you want perfect reproduction.
The band stand in your town, cathedrals, theatre stage, are all built like Sheltone.
It is built like these to take advantage of the most correct acoustic principles and to reproduce music and speech perfectly.
If your dealer cannot supply you order direct.
Loud Speaker, Complete....$16.00 Postpaid
Loud Speaker, No Phones....$4.00 Postpaid
C. O. D. or Cash with Order.
Dealers, Write for Discounts.
THE SHELTONE CO.
66 HALSEY ST. NEWARK, N. J.

RUSONITE
CRYSTAL RECTIFIER
MULTIPOINT
(Patent Pending)
A Synthetic CRYSTAL DETECTOR sensitive over its entire surface
Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.
Price, mounted. Sensitiveness guaranteed 50c
RUSONITE CATWHISKER
14-Karat Gold Multiple contact. Supersensitive 25c
Order from your dealer or direct from us.
Rusonite Products Corp., 21 Park Row, N. Y.

PATENTS
promptly procured. Trade Marks designed & registered.
FREE INVENTION RECORDING BLANK
Phone Vanderbilt 7313
MANUFACTURERS PATENT CO. Inc.
320 FIFTH AVE NEW YORK

AUXILIARY TUNER



Helps Cut Out Those Interfering Stations

Not a mere wave-trap, but a high-grade tuner which when connected in series with antenna will materially improve the selectivity of the average receiver.

One piece molded Condensite Case.
Send Cash or Money Order.

Regular retail list, $7.50. Special Introductory Price... **$5.45** post paid

GUARANTEED TO IMPROVE YOUR SET OR MONEY REFUNDED.

RADIO MULTI-PARTS
897 17th Street Newark, N. J.

WE REPAIR WD-11, $3.50

AND POSTAGE.

Also other vacuum tubes, excepting VT-1 and VT-2.

Mail orders solicited and promptly attended to.

H. & H. RADIO CO.
514 Clinton Avenue Newark, N. J.

ROBBINS

RADIO DESK

An attractive piece of furniture so constructed and designed to meet all the requirements in making a neat installation of the radio in the home. Its many advantages and moderate cost make it almost indispensable.

For Sale By First Class Furniture and Radio Dealers or Write

ROBBINS WOODWORKING CO.
LIBERTYVILLE, ILLINOIS

You Need It!

Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 20?

This hook-up actually goes out and drags the distance in, and lays it at your table.

All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?

If you haven't this copy, send 15 cents to Radio World, 1493 Broadway, New York, N. Y., and copy will be mailed you. Or start your subscription with that number.

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President and Editor
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.

European Representative: The International News Co., Breams Bldgs., Chancery Lane, London, Eng. Paris, France: Brentano's, 37 Avenue de l'Opera.

Managing Editor: Stephen L. Coles
Technical Editor: Robert L. Dougherty

Field Representatives:
New York—Arnold D. Friedman, W. H. Otte.
Chicago—Stevens & Baumann, Inc., First National Bank Building.
Los Angeles—Stevens & Baumann, Inc., Higgins Bldg.
San Francisco—Stevens & Baumann, Inc., Holbrook Bldg.

SUBSCRIPTION RATES

Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.
Add $1.00 a year extra for foreign postage. Canada 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES

One page: One time—$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—$5.00. Per agate line $0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

What Makes an Advertisement Pay?

There is an interesting editorial in the Advertising Club "News" this week telling how the same mail order advertiser had two advertisements prepared by two different copy writers.

Each adv. was of the same size, in the same publication, advertising the same article at the same price, and so "keyed" that an exact record could be kept of the returns from each.

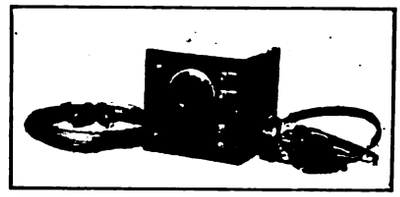
One advertisement brought inquiries at $1.34 each and produced business amounting to $742. The other adv. brought inquiries at 18c. each and produced business amounting to $4,452.

See the letter of Frederick H. Pruden in another column, and note the fine results RADIO WORLD brought him. It will bring any other manufacturer or distributor equally good results—if the advertising copy is equally good.

RADIO WORLD's copy chief has had twenty years' experience. We are in intimate touch with our readers, know their buying problems and interest, receiving as we do hundreds of letters and inquiries from them daily from every part of the country. We are at your service. Address Advertising Copy Chief, RADIO WORLD, 1493 Broadway, New York.

Subscribe for RADIO WORLD, $6.00 a year, $3.00 six months, $1.50 three months.

The Radio (Trade Mark) Flivver



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RADIO RESEARCH GUILD

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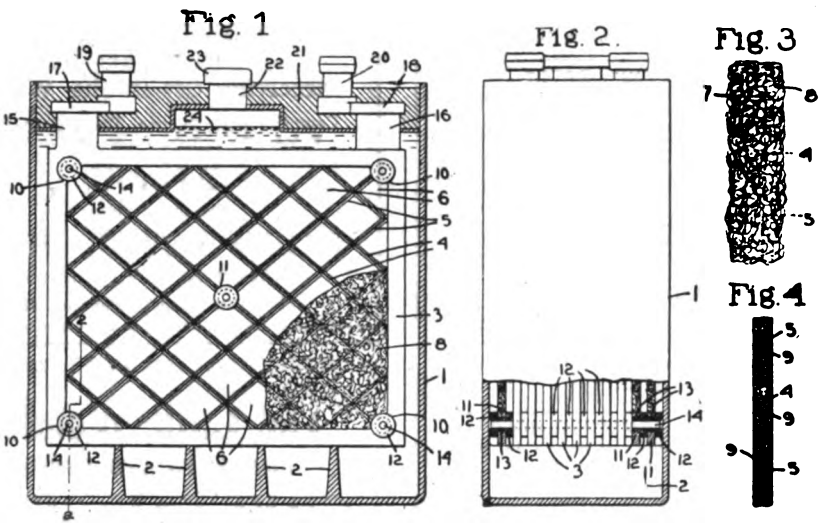
Latest Radio Patents

Storage Battery and Process

No. 1,450,533: Patented April 3, 1923. Patentee: Albert H. Williams, Worcester, Mass.

THIS invention relates to improvements in storage batteries and the process of producing the same and the general object thereof is to provide a storage battery which will have a greater efficiency and a longer life than batteries heretofore constructed and which can be produced at a much less cost, and in a shorter time. More specifically the object of the invention consists in the production of a storage battery comprising plates in which the active material is of greater strength and purity and of increased and uniform porosity which will enable a better circulation of the electrolyte and in which the conductivity of the active element will be increased by the perfect electric contact between the particles of the active material, so that the electrical resistance will be reduced and in which, by reason of the purity and porosity of the active material, substantially no local electric action will take place and polarization during a heavy rate of charge or discharge will be substantially eliminated. A further object of the invention is to produce plates for a storage battery which will not warp or buckle and which will be of such a character that the breaking away of the active element during charging and discharging will be substantially eliminated. A further object of the invention is to provide an electric battery of a character which will not require the positioning of separator plates between the positive and negative plates of the battery, whereby the resistance of the usual separator plates to the passage of the electric current through the electrolyte will be eliminated. A further object of the invention is to provide a storage battery in which the negative and the positive plates as initially constructed will be composed of a core or grid having pure sponge lead integrally attached or welded thereto. Another object of the invention consists in treating the plates in such a manner during their production that the necessity for the long period of charging usually required in the production of storage batteries will be rendered unnecessary and a completely charged storage battery produced within the period of less than an hour, whereas in batteries as hereto fore produced the construction and charging of the batteries usually requires several days.

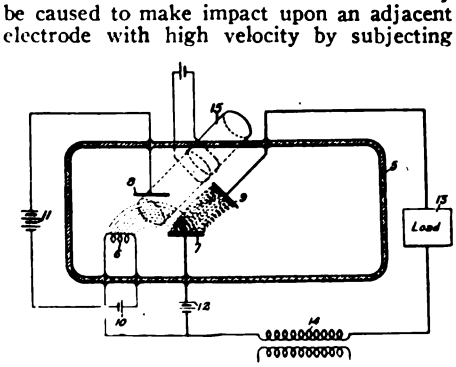


Albert G. Williams' new method of filling the plates in a storage battery with sponge lead, exposing a greater surface to the electrolyte.

Hot-Cathode Tube

No. 1,450,265: Patented April 3, 1923. Patentee: Joseph Slepian, Wilkinsburg, Pa.

THIS invention relates to hot-cathode apparatus, such as is used for rectification and in detector-bulb work and it has for its object to provide apparatus of the character designated that shall embody means for providing a strong and effective electron emission. The accompanying drawing is a diagrammatic view of an electron tube, together with associated supply and auxiliary circuits, illustrating one application of the invention. In the construction and operation of electron tubes, it has been usual to employ incandescent filaments as electron sources, these filaments being maintained at incandescence by the passage of heating current there through. The use of a filament of sufficient size and temperature to produce the large electron streams required in certain forms of apparatus engenders a relatively large amount of heat that must be dissipated and, furthermore, the filament is subject to rapid deterioration because of the high temperature at which it must be run, thus limiting the useful life of the apparatus. A relatively small incandescing filament may be operated at moderate temperatures to produce a small number of electrons and these electrons may be caused to make impact upon an adjacent electrode with high velocity by subjecting them to the influence of a high-voltage electrostatic field. As a result, there is produced a profuse emission of electrons from the adjacent electrode by the joint action of reflection and of secondary emission, it being well known that the impact of a high-velocity electron upon another body may set free a large number of low-velocity electrons therefrom. The adjacent electrode, which is thus caused to be the seat of a profuse electron emission, may now be employed as a cathode in an auxiliary circuit, and a relatively large amount of current may be offered passage because of the large number of electrons available. If desired, the above process may be repeated, and the electrons set free from the adjacent electrode be caused to make impact upon still another electrode, setting free a still larger number of electrons therefrom, and this process may be continued indefinitely. A convenient method of manipulating the electron streams, in apparatus of this type, is by means of magnetic fields.

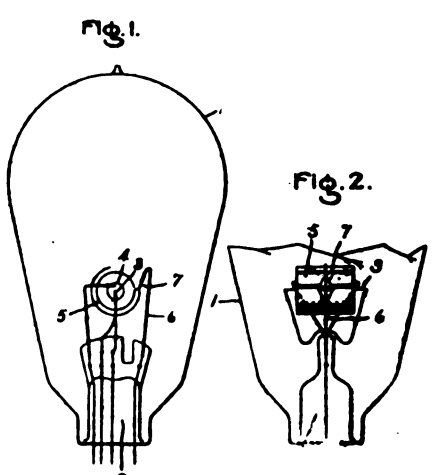


New method of sustaining electronic flow in a vacuum tube.

Vacuum Electric Discharge Device

No. 1,450,413: Patented April 3, 1923. Patentees: Herbert W. Edmundson and William T. Munro, Rugby, England.

THIS invention relates to vacuum electric discharge devices of the kind known as valves, rectifiers or the like such as are used in wireless telegraphy and for other purposes in which a heated cathode is employed. The object of the invention is to provide an improved discharge device in which the destructive effects resulting from the heat produced in the anode by the bombardment of the electrons from the cathode are eliminated as far as possible. According to the invention a shield preferably of metal is mounted within the device in such a position as to cut off the heat radiated from the anode during operation of the device. This shield may be of different shape according to the construction of the discharge device, and is separated from the anode so that the vacuous space between it and the latter serves to prevent it from becoming heated to any considerable extent. In applying the invention to a form of valve in which the cathode is located within a cylindrical anode, the whole being mounted on a glass stem within an evacuated bulb, the stem carrying the leading-in conductors for the device, the shield may be in the form of a cylinder of thin sheet metal almost completely, or completely, surrounding the anode or interposed between the anode and stem in any convenient way so as to prevent the stem through which the leading-in wires pass from being heated by direct radiation from the surface of the anode. As a result the heat radiated from the anode will be prevented from injuriously affecting the seal.



New constructional idea applied to a vacuum in order to prevent deterioration of elements through heat radiation from filament.

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Radio Telephony Rapidly Growing in Chile

IN Santiago, Valparaiso, and several other smaller Chilean cities, interest in radio telephony is growing steadily, and its fuller development only awaits the establishment of a broadcasting station within the country, such as those now in operation on the east coast of South America, says Assistant Trade Commissioner W. E. Embry in a report to the Department of Commerce. It is reported that the broadcasting stations recently erected in Buenos Aires, Montevideo, and Rio de Janeiro have given very satisfactory results, and large numbers of amateur receiving sets have been sold in these countries. This is especially true of the Argentine, where conditions for broadcasting programs are almost ideal, as the land generally is flat and radio transmission carries all over the River Plate district, Uruguay, and into southern Brazil on the north and as far as the Andes on the east. For this reason the sale of radio equipment has met with the greatest success in this country, and it is now estimated that there are approximately 25,000 sets in the Argentine Republic in comparison with approximately 100 less than one year ago.

American radio equipment, up to the present time, has been given preference. This is especially true of Chilean orders, as practically all equipment now in use in Chile is of American origin. Four or five concerns in Santiago deal in this class of goods, and a similar number handle radio apparatus in Valparaiso. Estimates of the number of sets throughout Chile vary between 100 and 500.

The Chile Radio Corporation, a local Chilean concern, with offices on the top floor of the highest office building in Santiago, has a very good amateur broadcasting station with one-kilowatt power, and programs consisting mainly of music are being offered from time to time. Outlying cities within a radius of 300 miles report that the concerts are heard very distinctly under normal weather conditions.

Another smaller broadcasting station has been maintained in Providencia for the past three or four months by a local amateur radio enthusiast, and programs consisting of phonograph records have been broadcast successfully. Providencia is an outlying suburb of Santiago. The broadcasting from this station is carried on by an improvised equipment of 20 watts power.

Numerous native Chileans have shown unusual interest in all matters pertaining to radiotelephony and its development. Amateur sets have been constructed and experiments are continually being made by local amateur enthusiasts. It is not unusual for amateurs in Santiago to receive, or rather intercept, messages sent out from stations in Honolulu, France, Japan, the United States, and other distant places. One of the local amateur stations recently heard very distinct messages from Arlington, District of Columbia.

Non-Sectarian Church to Receive Services by Radio

At Wellesley Hills, Mass., a new church will soon be opened which, instead of broadcasting its services, will receive them from other churches or from broadcasting stations by special arrangement. Roger W. Babson, the noted statistician, is the donor of the church, which will be equipped with a radiophone receiving set and loud speaker. Thus the music, sermons, prayers and other features of church ritual will be audible to the congregation. The church will be non-sectarian. On Sundays services will be held for Catholics, Baptists, Congregationalists

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FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows, in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

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United States Radio Exports During 1922

THE total value of radio apparatus exports from the United States in 1922, as compiled by the Department of Commerce, was $2,897,799, distributed among the various months as follows: January, $9,274; February, $283,950; March, $21,180; April, $116,221; May, $186,525; June, $547,364; July, $385,861; August, $188,670; September, $207,535; October, $564,803; November, $223,180; December, $163,236.

Statistics showing the United States exports of radio apparatus include, of course, material for high-power telegraph stations, several of which are being erected with apparatus shipped during 1922. This accounts for the relatively high percentage exported to Poland, Cuba, Mexico, Japan, Uruguay, and probably, to some extent, Argentina.

Canada ranks with the domestic market on account of the large amount of broadcasting being done and the proximity of its centers of population to stations in the United States. The heavy shipments to Argentina last fall were intended partly for Chile and other neighboring countries, Buenos Aires being used as a distributing point.

It is interesting to note that over 81.5 per cent. of the entire amount exported was shipped to four countries, whose total population (89,141,219) is only a little under 6 per cent. of that of the entire world outside of the United States. The following percentage of the total United States radio apparatus exports in 1922 was taken by the various countries: Canada, 28.2; Argentina, 22.5; Poland and Danzig, 19.8; England, 11; Cuba, 4.1; Mexico, 3; Brazil, 2.6; Japan, 1.4; Uruguay, 1.4; Philippine Island, 1.1; New Zealand, 1, and all other countries, 3.5.

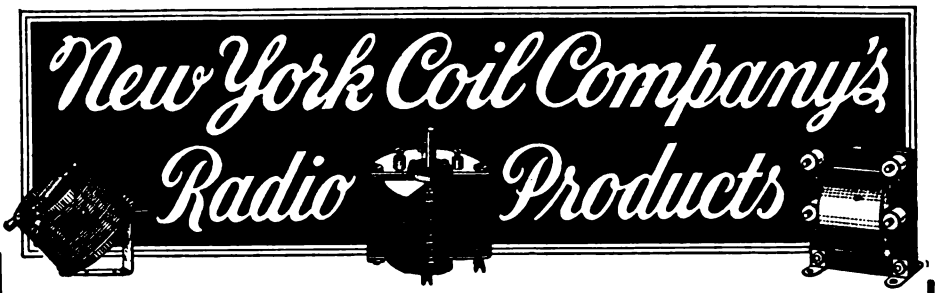
Radio Permeates the Universe

First Yegg—"Say, Bill, I seen a radio in dat house up de block dat we jest passed. Whatcha say we does de monkey up an' freezes onto some of de junk? It brings lotsa jack."

Second Yegg—"Fer de luvva Pete, hang offa dat! Dontcha know dat kinda stuff is woise dan snitchin' candy off'n a bawlin' brat? Dem radio nuts raise all cane when dere wives even dust dem blame tings off. D'ya wanta raise de neighborhood? Dese guys sits up till mornin' t'hear de blame stuff."

First Yegg—"Huh, howdayagetdatway? How d'ya know?"

Second Yegg—"'Cause I got one of dem tings meself. Now laugh dat off!"



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TUBES	ONE TUBE SET
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Eliminates the hissing and all disagreeable noises.

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500 Attend Milwaukee Radio Amateurs' Club Affair

BEFORE an audience of 500, many being broadcast listeners, the Milwaukee Radio Amateurs' Club, Inc., recently exhibited the two-reel radio film, "The Wizardry of Wireless." Following the exhibition, A. R. R. L. City Manager I. H. Strassman, 9AHO, and E. T. Howell, Sc. M., technical committee chairman, addressed the gathering on the subject of the relations between the amateurs and the radiophone people. The progress being made in ridding the air of unlicensed stations was reported, and the efforts of the traffic committee to bring about cordial feeling between the two classes was called to the assembly's attention as well as a description given of that committee's work.

"Radio Frequency Amplification System" was the title of a paper presented by E. D. Nunn, ex-9FE, a Milwaukee radio engineer, in which stress was laid on the use of R. F. amplification with two variometer receptors. This lecture is the first of a series being arranged by the new program committee chairman, H. F. Waring, pre-war 9AEX, and president of the society. H. P. S. Day, Sc. B., a telephone engineer, presented the second paper under the title of "Vacuum Tube Characteristics." In non-technical language some of the fundamentals as well as the applications of the thermionic valve were treated in interesting fashion.

Upon his return from San Francisco, Charles S. Polacheck, a former secretary-treasurer, addressed the members under the title of "Some Experiences of a Wayfaring 'Ham' in the West," and told of his meeting with a former speaker at the club, L. E Grogan, formerly radio engineer to the government of Southern China; also he related his experiences as a guest of the San Francisco Radio Club, Inc., at several of their interesting meetings.

The club's code class for faddists is meeting weekly at 7:15 p. m., Thursdays, in the Public Museum's Trustees' Room, while the society's regular meeting is held at 8:00 p. m. in the same room and on the same evening.

Amateurs to Broadcast News

E. H. SCHNELL, Hartford, Conn., traffic manager of the American Radio Relay League, has authorized the appointment of 125 amateur stations for the distribution of amateur news items by radio. During recent storm emergencies in the upper Mississippi Valley both amateur operators and broadcasting stations supplemented wire service, temporarily out of commission, enabling a number of papers to keep in touch with news centers and correspondents. Whenever such emergency occurs again in any part of the country these amateur stations will be at the service of railroads, newspapers and the public.

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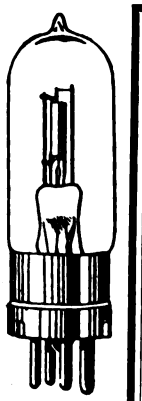

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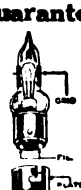

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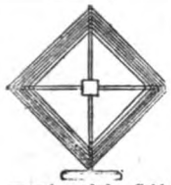

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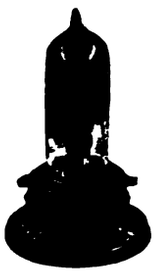

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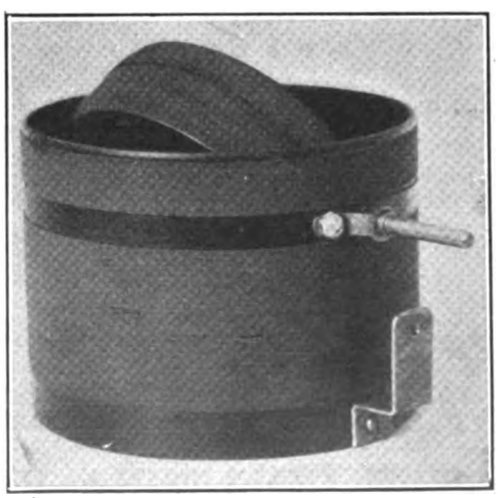

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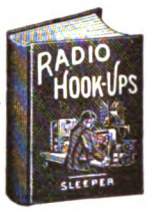

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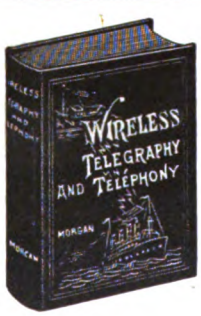

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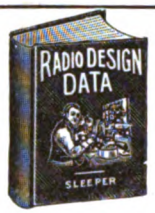

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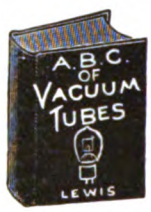

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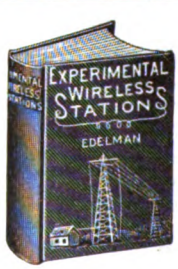

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General Electric Making Collection of Vacuum Tubes

DURING an address on "Radiotrons" by W. C. White, of the General Electric Company's Research Laboratory, which recently was broadcast from WGY, Mr. White made the following interesting appeal to radio fans:

"For some time past, we have been making a collection of vacuum tubes to illustrate the development of this interesting art. A number of years from now such a collection will be of great interest and of considerable historical value.

"We would like to ask radio fans to assist us in making more complete this vacuum tube collection.

"It is natural, however, that we are only desirous of obtaining additions to this collection and, therefore, are interested only in tubes of other than General Electric manufacture. What we desire to obtain are tubes of very early manufacture, tubes of unusual design and those of other countries, particularly Italian, Japanese and German. It is not essential that these tubes be in operating condition. The filament may be burned out or the vacuum impaired, but they should be in satisfactory mechanical condition.

"If any radio fans have such vacuum tubes I shall be very glad to have them write me, describing their tubes briefly and if they form an addition to our collection we will write their present owners offering them on receipt of their tubes to send them in exchange for each one of interest to us, one of the new UV-199 radiotron tubes. We will also include a socket for each tube and complete operating instructions. Address all communication relative to tubes of possible interest to us for this collection to WGY, General Electric Company, Schenectady, New York.

"It is particularly requested that any who have such tubes should write first and wait for a letter from us before shipping their tubes to us to learn whether they have any historical interest as an addition to our collection."

Newspaper Publishers Appoint Radio Committee

AT the recent annual convention of the American Newspaper Publishers' Association, held in New York City, a committee was appointed to study the radio questions which had been discussed by the convention, such as whether radio broadcasting programs in news columns are not free advertising, and to report at the 1924 convention. C. P. J. Mooney, of the Memphis, Tenn., *Commercial Appeal*, was named as chairman. The other members are: W. A. Strong, Chicago *Daily News;* E. B. Piper, Portland, Oregon, *Oregonian;* Daniel Nicoll, New York *Mail;* Louis Hannoch, Newark *Sunday Call;* Harry Chandler, Los Angeles *Times;* Elzey Roberts, St. Louis *Star;* Rowe Stewart, Philadelphia *Record;* Amon G. Carter, Fort Worth, Texas, *Star-Telegram,* and H. S. Scott, Detroit *News.*

Holland Opens Powerful Radio Stations

WHAT are claimed to be two of the most powerful radio stations in the world have just been opened at Kootwyk, Holland, and at Bandoeng, Java, in the Dutch East Indies. They are 7,500 miles apart and each occupies an area of 750 acres. The most satisfactory wave length so far determined by experiment is 8,400 meters for use after sundown. During the day better results were obtained on 16,800 meters. The stations were built by the Telefunken Company after the plans of the big wireless plant at Nauen, Germany. Politically considered, Holland may now communicate with her distant colo-

The Height of Efficiency
Crosley Model X—Price $55

Clearly, distinctly, as though given in the same room, messages from W. L. W. Broadcasting Station, Crosley Mfg. Co., Cincinnati, are heard in all parts of America if a Crosley Model X—a four-tube radio frequency set—is used. This remarkable instrument, very easy to tune, simple and beautiful in construction, has repeatedly brought in messages over 4,900 miles away.

Write for Catalog Showing Complete Crosley Line

For Sale by Best Dealers Everywhere

Besides a complete assortment of receivers, Crosley manufactures parts for replacement or home construction.

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New York Office: C. B. Cooper, 1503 Tribune Bldg., 154 Nassau St.

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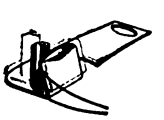
Chicago Office: 1311 Steger Bldg., 28 E. Jackson Blvd.—R. A. Stamm, Mgr.

Crosley Manufacturing Co.

5403 ALFRED ST. CINCINNATI, OHIO

Na-ald Special Socket No. 499



Na-ald De Luxe No. 460

It's the contact that counts

The dual-wipe contact strips of the Na-ald De Luxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties this socket keeps plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

Price 75 cents

The Na-ald Special Socket No. 499 is a sturdy little socket for the G. E. No. 199 dry-cell tube. It has special slot construction, and is moulded of genuine Bakelite. The heat from soldering connections will not affect these sockets.

Price 50 cents

Booklet with wiring design and instructions for Hazeltine's Neutrodyne circuit, together with other selected circuits, packed with each Na-ald product or sent in exchange for cover taken from any Na-ald carton.

Alden Manufacturing Co.

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Cockaday Circuit TUNER COILS

Complete as per specifications

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

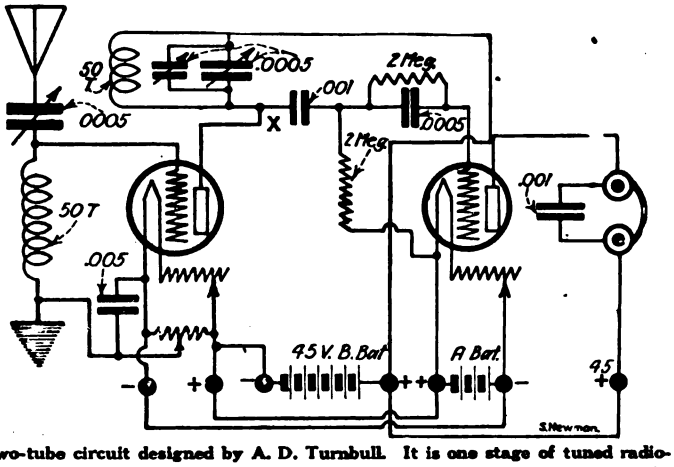
Vol. III, No. 8. Whole No. 60 | May 19, 1923 | 15c. per copy, $6.00 a year

From Nova Scotia to Los Angeles with This Two Tube Set

By A. D. Turnbull

SEEING various diagrams and circuits that many of your readers send in I thought perhaps they would be interested in my two tube receiver with which I have done some very fine work. It is simple and very selective and besides being sensitive, it does not need an electrical engineer to figure it out or work it.

It can be seen from the illustration that it is a combination of the single circuit regenerative circuit with one stage of tuned radio-frequency. The variable condenser in the antenna circuit is an A. B. C. 23 plate, but any other good one will do. The tuning inductance in my set is a variometer with 50 turns on both stator and rotor. This variometer is split using the unit as a coupler, the rotor being used as a tickler and the stator as antenna inductance, the fine tuning being accomplished by means of the antenna condenser. I have found that it is best to buy the variometer and then separate the connections between the rotor and stator, rather than make your own as besides being a hard job, the variometers you purchase are always more reliable as to workmanship—that is unless you have a lathe, can turn your stator out and make a former to wind the wire on.



Two-tube circuit designed by A. D. Turnbull. It is one stage of tuned radio-frequency, in combination with a single circuit regenerative, and is remarkably selective and sensitive.

A Canadian R-215A dry cell tube is used, with a Klosner 200 ohm potentiometer across the filament lead of the first tube. I have experimented with both the common A leads, and separate batteries for each tube, and find that the difference is so slight that it does not matter. I advise using one battery so as to save both trouble in wiring and also the expense of a separate set of batteries. For good work a very fine control rheostat should be used, preferably one of the carbon unit type, such as the Bradleystat. This is one of the most important controls of the entire circuit and it is absolutely necessary to good work that fine control of the filament current be had.

Although this circuit will give wonderful results on 45, I have found it necessary to use higher voltage, especially when doing real distance work. Then sixty volts should be used on the plate.

The fixed condensers are all mica insulated and should be the best you can buy as you will benefit much more by using good apparatus in this circuit as well as any other.

The values of the different condensers are as follows: Phone condenser .001mfd.; grid, .0002mfd.; potentiometer-filament condenser, .005mfd.; condenser in plate circuit of first tube (critical) .001mfd. The grid leaks are not at all critical, but I have found that by using the popular variable type, the best capacity can very easily be found and once found will remain constant for a given tube. This eliminates considerable tuning.

When the set is wired trace your connections and see that they are all O. K. before turning on the tubes. Then, turning the potentiometer to the negative side of the filament circuit, turn on the filaments and if oscillations are not immediately noticed reverse your rotor leads. Place your plate condenser at approximately 90°, and tune in with the antenna condenser. Outside of tuning the plate coil (rotor) to resonance by means of the condenser, the tuning on this circuit is exactly the same as any other single circuit regenerative. In tuning the plate coil first get your station in and then bring it in louder with your condenser and vernier, keeping constant watch on the filament current and turning it down if the set oscillates too violently, which will destroy the brilliance and tone of the signals.

With this circuit and two dry cell tubes I have copied the following stations from Sydney, N. S., Canada:

When I say copied, I do not mean simply hearing the call, but either the whole, or part of a program. KHJ Los Angeles and 2LO London, England, are the two extremes. In between these I have copied: WOAI, WFAA, WBAP, WPA, Texas; WKAF, Denver, Colo.; WSB, Atlanta, Ga.; PWX, Havana, Cuba.

I think that with this set working properly and using the best apparatus obtainable anyone who constructs it will be pleasurably surprised at the distance he can get and the selectivity and freedom from noise which is one of the noticeable features of this little circuit.

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Radiophone Broadcasting Committee, Second District, Decides on Wave Lengths Effective May 15

THE conference, composed of the members of the Radiophone Broadcasting Committee, was held at the U. S. Custom House, New York City, to inform the broadcasting interests concerning the new classifications of broadcasting stations to be hereinafter known as Classes A, B and C. The necessary requirements, together with a resume of the new plans governing broadcasting stations in the Second District was carefully gone into, and a new time schedule of operation established. The following representatives were present:

American Telephone & Telegraph Co.—A. H. Griswold, W. E. Harkness, E. Miller, R. Brown; L. Bamberger & Co.—Edgar Bamberger, W. S. Moler, J. R. Poppele; Calvary Baptist Church—George F. Koster; De Forest Radio Tel. & Tel. Co.—G. C. Crom; General Electric Co.—M. P. Rice, Harry Sadenwater; D. W. May & Co.—D. W. May, William Brough; I. R. Nelson & Co.—I. R. Nelson, Jr., R. H. Horning; New York Police Department—M. R. Brennan; Radio Corporation of America—Dr. Alfred J. Goldsmith, J. Weinberger, W. A. Graham; Westinghouse Elec. & Mfg. Co.—W. H. Easton, C. W. Horn, Charles B. Popenoe; New York City (Municipality)—R. Atchison; Peoples' Pulpit Association—H. C. Kuser; Radio Shop of Newark—H. Lubinsky; Rensselaer Polytechnic Institute—Prof. W. J. Williams; Ridgewood Times Publishing Co.—George Schubel, William Boettcher; Seventh Day Adventist Church—Dr. C. B. Haynes, L. K. Dickson; Ship Owners' Radio Service—J. B. Ferguson, D. M. Kendall; H. C. Spratley Radio Co.—H. C. Spratley; Tarrytown Radio Research Laboratory—Frederick Koenig; Union College—M. P. Rice; Wireless Phone Corporation—J. O'Connor; Western Electric Co.—O. M. Glunt, N. H. Slaughter. Observers: E. N. Davis, United Press; O. E. Dunlop, Radio Editor, New York Times; F. P. Guthrie, U. S. Shipping Board, Washington, D. C.; C. B. Cooper, C. B. Cooper Co.

The following articles of agreement were drawn up:

1. That the committee, known as the Inter-Company Radiophone Broadcasting Committee of the Second District, continue its activities and that Arthur Batcheller, United States Supervisor of Radio, in charge of the Second District, remain as chairman.

2. That the hours most suitable for broadcasting are those between 9:00 a. m. and 12:00 midnight daily.

3. No experimental transmission work on radiating antennae on wave lengths between 200 and 1,000 meters will be permitted between the hours of 11:30 a. m. and 12:00 midnight, local standard time.

4. It was agreed that where a number of Class "A" stations could operate simultaneously on the same wave length without causing interference, that this practice should be permitted.

The following resolution, introduced by M. P. Rice, of the General Electric Company, seconded by Dr. Alfred N. Goldsmith, of the Radio Corporation of America, was unanimously adopted:

RESOLVED: In the judgment of the Radiophone Broadcasting Committee of the Second District, the useful operating time on all Class "B" waves is so fully occupied by suitable broadcasting station schedules that the committee respectfully petitions the Secretary of Commerce, in the public interest, that no further licenses on these wave lengths, during the time mentioned, be granted.

The following resolution introduced by W. S. Moler, of L. Bamberger & Company, seconded by A. H. Griswold, of the American Telephone & Telegraph Company, was unanimously adopted:

RESOLVED: That this conference go on record with a rising vote of appreciation to Secretary Hoover for his efforts and the co-operation extended by Arthur Batcheller, U. S. Supervisor of Radio, in charge of the Second District, in effecting an amicable adjustment of the broadcasting situation in this district, and that a copy of this resolution be forwarded to the Secretary of Commerce and to the press.

The following time schedules of radiophone broadcasting stations was adopted:

CLASS "A" STATIONS—233 METERS

Assigned to the Radio Shop of Newark, 76 Springfield Ave., Newark, N. J., station not in operation at the present time; call letters not yet assigned.

CLASS "A" STATIONS—244 METERS

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
9:00¹—11:30¹	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	
12:30²— 5:30²	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	
10:00¹—12:00³							WBAN
2:00²— 5:00²							WBAN
7:00²—10:30²							WBAN
7:15²—10:45²	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	

CLASS "A" STATIONS—263 METERS

11:00¹—12:45²						WSAP	
11:00¹— 2:00²	WAAM	WAAM	WAAM	WAAM	WAAM		
12:45²— 2:00²						WAAM	
7:45²— 9:30²					WSAP		WSAP
8:00²—10:30²	WAAM	WAAM	WAAM	WAAM		WAAM	

CLASS "A" STATIONS—273 METERS

11:00¹—12:00³							WFAF
7:30²— 9:00²							WRW
8:00²—10:00²		WFAF	WFAF		WFAF	WFAF	
8:00²—11:00²	WRW			WRW			

CLASS "B" STATIONS—380 METERS

10:25¹—12:30²							WGY
11:55¹—12:00³	WGY	WGY	WGY	WGY	WGY	WGY	
12:30²—12:50²	WGY	WGY	WGY	WGY	WGY	WGY	
2:00²— 2:30²	WGY	WGY		WGY	WGY		
4:00²— 5:30²							WGY
6:00²— 6:30²	WGY	WGY	WGY	WGY			
6:00²— 6:45²					WGY		
7:30²— 9:30²							WGY
7:40²— 9:45²					WGY		
7:40²—10:00²		WGY					
7:45²— 9:00²	WGY						
7:45²—10:00²				WGY			
9:00²—10:30²	WHAZ						
9:00²—11:00²						WGY	
10:30²—12:00⁴					WGY		

CLASS "B" STATIONS—405 METERS

11:55¹—12:15²	WDT	WDT	WDT	WDT	WDT	WDT	
2:30²— 4:00²	WOR	WOR	WOR	WOR	WOR	WOR	
2:30²— 5:00²							WJY
4:00²— 6:00²	WJY	WJY	WJY	WJY	WJY	WJY	
6:00²— 6:30²							WJY
6:15²— 7:00²			WOR				
6:15²— 7:30²	WOR	WOR		WOR	WOR	WOR	
7:00²— 8:00²			WDT				
7:30²—11:00²					WJY		
7:30²—11:30²		WJY		WJY			
8:00²—11:00²	WOR		WOR			WOR	
11:00²—12:00⁴	WDT				WDT		

CLASS "B" STATIONS—455 METERS

10:30¹— 1:00²							WJZ
3:00²— 5:00²—Peoples' Pulpit Association—Sunday Only.							
3:00²— 6:30²	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	
7:30²—11:30²	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	
6:30²— 7:30²—Peoples' Pulpit Association—Mon. to Sat. Incl.							
8:00²—10:30²							WJZ

CLASS "B" STATIONS—492 METERS

To be used jointly by the American Telephone & Telegraph Company Station WEAF, New York City, and Western Electric Company Station WBAY, New York City.

CLASS "C" STATIONS—360 METERS

9:00²— 9:30¹	WLAW	WLAW	WLAW	WLAW	WLAW	WLAW	
9:30¹—11:00¹	WHN	WHN	WHN	WHN	WHN	WHN	
10:30¹—12:30²			10:30²—12:30²				
11:00¹—12:00³	WBS	WBS	WBS	WBS	WBS	WBS	
12:00³ - 1:00²	WHN	WHN	WHN	WHN	WHN	WHN	
12:30²— 3:00²							WBS
1:00²— 2:15²	WBS	WBS	WBS	WBS	WBS	WBS	
2:15²— 3:15²	WHN	WHN	WHN	WHN	WHN	WHN	
3:00²— 5:00²							WHN
3:15²— 3:45²	WLAW	WLAW	WLAW	WLAW	WLAW	WLAW	
3:45²— 5:30²	WHN	WHN	WHN	WHN	WHN	WHN	
7:00²— 7:30²	WLAW	WLAW	WLAW	WLAW	WLAW	WLAW	
7:30²— 9:30²	WHN	WBS	WHN	WBS	WBS	WHN	
8:00²— 9:30²							WQAO
8:15²—10:30²			WNJ				
9:30²—12:00¹	WHN	WHN	WHN	WHN	WHN	WHN	WHN

NOTE: 1 means A.M.; 2 means P.M.; 3 means Noon; 4 means Midnight.

(Continued on next page)

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This Compact Receiver Gets What Others Miss

By Loring Coes

IN RADIO WORLD for April 28 I notice an article on "A Compact Universal Receiver." I am enclosing two photos showing a small set employing the same circuit, which I have been using for nearly a year. It is the most consistent performer and the simplest set to operate that I have ever seen. I keep the set on the desk and when I want to find out what the other sets are missing I hook it up.

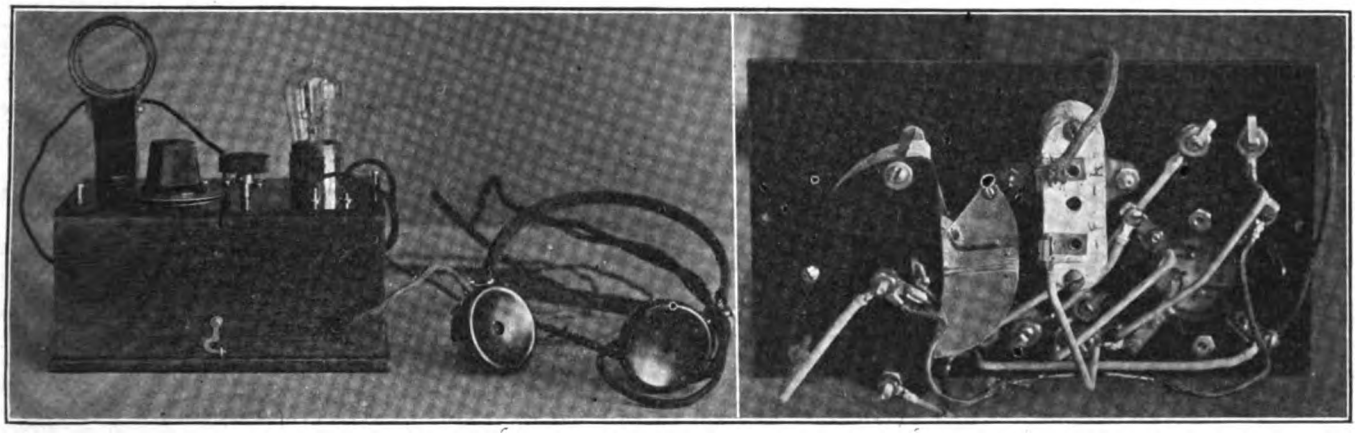
The case is an old medical vibrator case, and the panel is 4¾ x 7. Six cord jacks and two leads (A battery) make the connections. I decided to use a separate terminal for each battery connection, because the switching of polarity, especially on long waves, is sometimes a great help. I do not use a phone condenser, and no leak on broadcast stations. Over 2,000 meters call for a one meg. leak.

The grid condenser is mounted on the case and in the photo the two free wires at the bottom are the connections for the leak. The rheostat is the vital factor and the connections to the honeycomb must be right.

Since the photos were made I have lined the case with 40 gauge and grounded it, which effectively kills all capacity effects.

With an aerial 110 feet long I have heard stations up to 1,800 miles distant, including WKAQ at San Juan and PWX at Havana. Kansas City, Atlanta and Chicago stations are heard regularly. Recently I constructed a similar set adding two stages AF, and the results are more than satisfactory.

I have rewired this set three times, trying each time to cut down the footage, and have finally got it down to 31 inches of bus bar without the external battery leads. I hope this may interest someone planning a similar set.



Two views of Mr. Coes's compact, simple and efficient receiving set.

Radio Makes Every Sea Captain Own Forecaster

WITHIN a short time "skippers" of ocean going vessels equipped with radio will be making their own forecasts and weather maps daily, according to Chief Forecaster Edward H. Bowie, of the U. S. Weather Bureau. This is due primarily to efficient and immediate radio service.

Since his return from a long trip on the Atlantic ocean in the French ship "Jacques Cartier," Mr. Bowie is very enthusiastic over the prospects of forecasting at sea, and urges its practice on American vessels. With the vast amount of meteorological information broadcast today from practically all large radio stations and many ships it is possible, he says, for masters of vessels to make their own forecasts and even make a daily plot of weather conditions, just as is done in the Weather Bureau in Washington. The Naval radio station at Arlington sends out daily a general report from North America and in return receives a similar report from Paris on European conditions.

Since most storms journey eastward, a "skipper" in the Atlantic knows generally what is coming and by keeping in touch with vessels west of him he can do his own forecasting. In turn, he keeps other ships posted as to conditions in his location.

(*Concluded from preceding page*)

KEY TO CALL LETTERS

CLASS "A" STATIONS

WAAM—I. R. Nelson & Company, Newark, N. Y.
—Radio Shop of Newark, Newark, N. J.
WSAP—Seventh Day Adventist Church, New York City, N. Y.
WFAF—H. C. Spratley Radio Company, Poughkeepsie, N. Y.
WRW—Tarrytown Radio Research Laboratory, Tarrytown, N. Y.
WBAN—Wireless Phone Corporation, Paterson, N. J.

CLASS "B" STATIONS

WEAF—American Telephone and Telegraph Co., New York City, N. Y.
WOR—L. Bamberger & Company, Newark, N. J.
WGY—General Electric Company, Schenectady, N. Y.
—Peoples' Pulpit Association, Richmond, S. I., N. Y.
WJZ—Radio Corp. of Amer. (Aeolian Hall), New York City, N. Y.
WJY—Radio Corp. of Amer. (Aeolian Hall), New York City, N. Y.
WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y.
WDT—Ship Owners' Radio Service, New York City, N. Y.
WBAY—Western Electric Company, New York City, N. Y.

CLASS "C" STATIONS

WQAO—Calvary Baptist Church, New York City, N. Y.
WBS—D. W. May & Company, Newark, N. J.
WLAW—New York Police Department, New York City, N. Y.
WHN—Ridgewood Times Publishing Co., Brooklyn, N. Y.
WJN—Shotton Radio Manufacturing Co., Albany, N. Y.

STATIONS TEMPORARILY OUT OF COMMISSION, THEREFORE NOT INCLUDED IN THE TIME SCHEDULE

—De Forest Radio Tel. & Tel. Co., Jersey City, N. J.
WCAB—Newburgh Daily News, Newburgh, N. Y.
—New York City (Municipality), Elmhurst, L. I., N. Y.
WRL—Union College, Schenectady, N. Y.
WWZ—John Wanamaker, New York City, N. Y.

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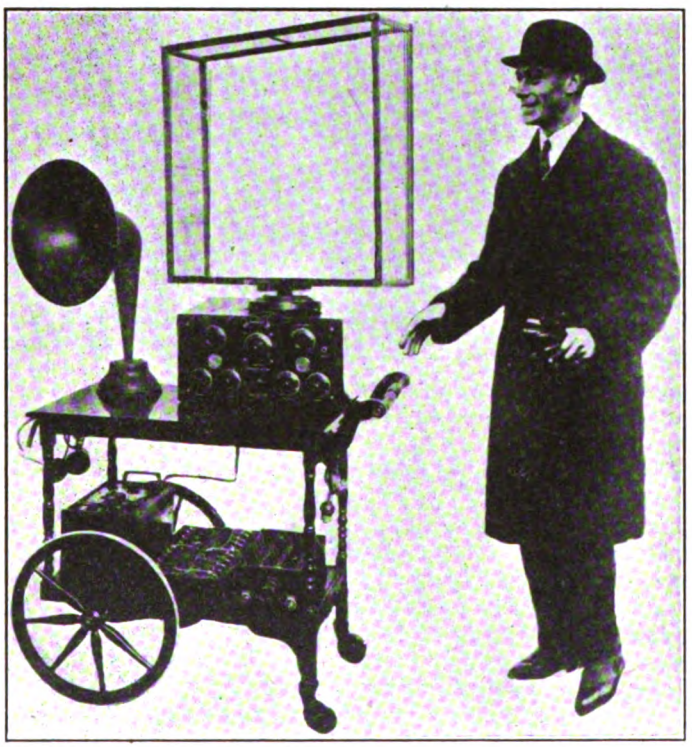
Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained in Plain Language for the New Radio Enthusiast

By Lynn Brooks

AUDIO-FREQUENCY TRANSFORMER: A transformer used to step up the small amounts of current flowing in the detector circuit. It consists of an iron or steel core, generally taking the shape of a square and surrounding the coil entirely, with a center bar of laminated iron or steel running through the winding. The primary is wound



(C. Underwood and Underwood)

The Duke of York and the de luxe receiver he acquired as a wedding present from New York. The set is a portabloop receiver and all the trimmings are of gold. It is mounted on a mahogany teacart and is complete in all details even to having a charger for the storage battery underneath.

over this center core, using very fine wire and waxed or impregnated paper between layers. Then over this primary is wound the secondary. Upon the ratio depends the number of turns that are wound upon this coil. Most transformers run about five to one, meaning that there is a ratio of five turns on the secondary to one on the primary. Some transformers run lower than this, having a ratio of three to one, and some run as high as twelve to one. These high-ratio transformers are not used much in anything but the first step. A transformer of nine to one in the first step and then three to one in the second step is the usual method of procedure. This does not apply for all cases, as with some tubes better results are obtained if transformers of fairly low ratio are used through the entire circuit.

B BATTERY: In order properly to operate a tube detector, or amplifier, it is absolutely essential that there be some means of putting a fairly high positive potential on the plate. The most common and economical way of doing this is to supply the circuit with high voltage from a series of small cells hooked or connected in series. It is well known that when cells are hooked in series that the voltage (pressure) varies as the number of cells, but the amperage remains that of any one of the cells in the group. The most common method of dealing with the battery problem has been to connect in series a number (generally 15) of very small dry batteries, setting them in an impregnated cardboard box and pouring melted compound around them to make them solid. The life of such a battery is necessarily limited, but even at that it is surprisingly long, a series of cells often lasting from nine months to a year, using the set for a couple of hours per evening. This is easily understood, however, when it is stated that, for most tubes, the plate will not use more than .6 or .8 milliamperes at the most, which is a very small amount. In storage cells (which have the advantage of always being charged if a little care is taken) there are 10 or 20 cells hooked in series, depending upon the voltage desired. These cells are exact replicas of their larger and more powerful brothers, the only difference being the plate surface, which is the governing factor of a battery's amperage or power feature. With these batteries it is, of course, not necessary to throw the battery away when it is run down, but it is necessary to recharge it through the agency of a rectifier if A. C. current is used, or a bank of lamps if D. C. current is at hand.

A BATTERY. In order to heat the filament of a tube some method of bringing the filament to incandescence must be available. This is because of the fact that, when the filament is heated, it has the property of throwing off electrons, which, as stated in a previous issue, perform the action of taxies for the electrical impulses that are waiting to jump across to the plate. If the tube used is of the six-volt type you must use a battery that will furnish sufficient current to heat the filament, and at the same time use one that will last. That is the reason for using the storage battery. It will furnish the desired current and give better and longer service than the dry cell, although four dry cells in series will furnish the tube with sufficient current to light it. The determining factor in this case is time and expense. With a storage battery the initial expense is ten or fifteen times as great as the dry cells, but when it is considered that, with the dry cells, you would probably get about 25 or 30 active hours' service you can easily see that the constant replenishing of the cells would be of greater eventual expense than the original cost of the storage cell. With the popular dry cell, or 1½-volt tube, it is a much easier matter to supply the filament current. The most common method is to use three to six dry cells hooked in parallel, the voltage remaining constantly 1½, but having the advantage of heavy amperage and consequently longer use. The new tubes consume very little current, using from .2 to as low as .06 ampere on some of the tubes.

PORTABLE SETS: During the summer months the portable sets come into great use. Now that the small tubes have become popular and do not necessitate large batteries it is possible to incorporate tube sets where it was only possible to take crystal sets heretofore. The filament can be supplied from three flashlight cells in series, and the plate battery from a small bloc-type, high-voltage battery.

VARIOMETER: A continuous inductance, the tuning of which is accomplished by tuning a rotor inside of the stator. The principle on which this apparatus works is that with two coils, the windings of which run concentrically, the inductance effect is minimum, as the induction field in each helps the other. As the rotor is turned, this field in each coil interferes with the other and the wave length to which the coils will correspond is raised. When the induction fields of both coils directly oppose each other the maximum is reached

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A Radiophone and Receiving Set Combined

By Carl Masson

WHEN the wave of radiophone popularity swept the world a little over a year ago, many new radio amateurs were born. First they were content with simple crystal receiving sets, but every real radio bug soon outgrows his first set, and that is why radio dealers are finding a new demand for parts comprised in the advanced V. T. circuits.

No doubt many of the "new arrivals" are now "dyed in the wool" to such an extent that they are contemplating the construction of a transmitting outfit. It is for the benefits of such amateurs that this article is written.

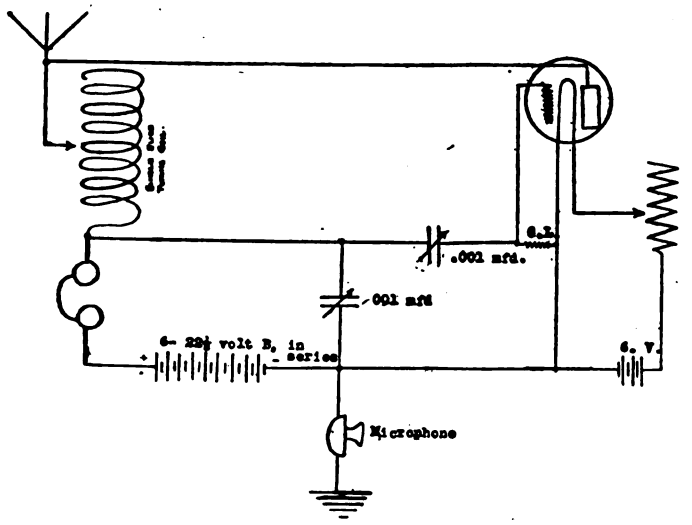

Fig. 1—Circuit diagram for a combined receiver and transmitter. When constructing this set it is best to use either a five-watt tube or one of the hard tubes, as better results will be secured.

a radiophone is because of the great expense and complicated apparatus usually attached to it. I am sure that this article overcomes both of these objections.

The drawings show a radio telephone capable of transmitting the voice a distance of 5 miles under good conditions. This outfit also has another advantage: It also may be used as a receiving set without any changes. The operator can hear the incoming signals while talking. He also can tell when the transmitter is properly tuned, as he can hear his own voice in the phones.

Now to get to the constructional details of the outfit. The panel should be of bakelite, or some other insulating material that is equally as good, and should measure 12x12x3/16 inches. This is supported by a wooden base. A single slide tuner serves as the inductance although, if desired, the constructer can wind a coil, taking taps to a switch on the panel, which may be more convenient. The coil should be about 12 inches long, 5 inches in diameter and wound with No. 28 D. C. C. wire, taking taps at every tenth turn.

The microphone is of the ordinary type. If desired, the hand style may be supplemented in place of the mounted one. The variable condensers, as stated in the circuit, are .001 mfd. in capacity.

The grid leak can be easily home-made. A piece of thin cardboard, 2 inches long and ⅛ inch wide should be soaked in India ink and mounted on a small block, with binding posts at each end.

The rheostat is the 10 ohm filament type. The V. T. is one of the "hard" type. One of the amplifying type of standard makes of tubes will serve quite well.

The plate voltage is obtained by connecting six 22½ volt "B" batteries in series, making a total of 135 volts. Although these "B" batteries are quite expensive, they will last a reasonable length of time. The filament

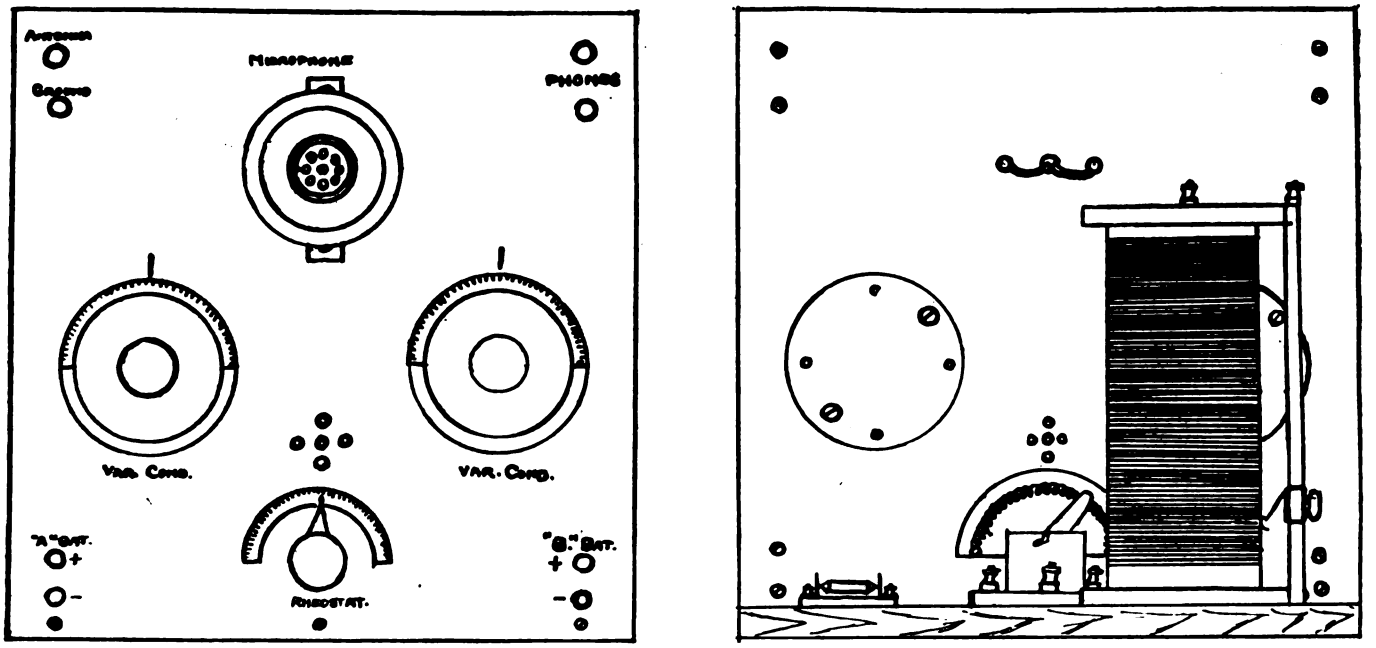

Fig. 2—Front and rear views of the panel, showing layout. The tuner is set because when transmitting a certain wave length is desired. For receiving, fine tuning can be accomplished with the condensers.

While many old timers may prefer the dot and dash method of ether communication, I believe the modern amateur who was born with the radiophone will naturally uphold it. The real reason why many amateur transmitters have turned their backs on constructing

voltage is the regular six volts—preferably from a storage battery.

The phones should always remain in the circuit while the outfit is in operation. They are connected between

(*Concluded on page* 14)

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Broadcasters Number 590—Name Wave Assignments

By Washington R. Service

WASHINGTON—The process of allocating new wave lengths and re-classifying radio broadcasting stations is a slow one. Department of Commerce radio officials do not expect to be able to issue a complete list of the three classes of stations with their wave lengths after May 15.

On May 4 there was a total of 590 broadcasting stations, including 32 A, 30 B and 528 C stations. During the last month 23 new stations were licensed, 10 were transferred from Class C on 360 meters to Class A, and 14 were dropped from the department's lists.

Sixteen new stations in eleven different states were licensed during the past week. Among them were two churches, two colleges, a high school, a military unit and a newspaper.

16 New Class A Supplemental List of Limited Commercial Broadcasting Stations Licensed.

Call	Station	Frequency Kcs	Wave Length Meters	Power Watts
K F G M	Abilene Daily Reporter, Abilene, Texas	1290	233	100
K F H F	Central Christian Church, Shreveport, La.	1130	266	150
K F G P	Cheney Radio Co., Cheney, Kansas	1310	229	10
K F H I	Dixon, Charles V., Wichita, Kansas	1340	224	20
K F G V	Heidbreder Radio Supply Co., Utica, Neb.	1340	224	10
K F G C	Louisiana State University, Baton Rouge, La.	1180	254	100
K F F X	McGraw Co., The, Omaha, Neb.	1080	278	250
K F G J	National Guard Missouri, 138th Infantry, St. Louis, Mo.	1130	266	100
K F H C	University of Oklahoma, Norman, Okla.	1180	254	20
K F H D	Utz Electric Co., St. Joseph, Mo.	1130	226	10
W A B D	Parker High School, Dayton, Ohio	1060	286	10
K F G Q	Crary Hardware Co., Boone, Iowa	1330	226	20
K F G Z	Emanuel Missionary Co., Berrien Springs, Mich.	1120	268	10
K F G X	First Presbyterian Church, Orange, Texas	1200	250	500
K F G Y	Gjelhaug's Radio Shop, Baudette, Minn.	1340	224	20
K F I C	Laskowitz, Philip, Denver, Colo.	1340	224	15

Broadcasters Transferred from Class C to Class A.

W N A X	Dakota Radio Apparatus Co., Yankton, S. D.	1230	244	100
W K A W	Turner Cycle Co., Beloit, Wis.	1240	242	10
W J D	Howe, Richard Harris, Granville, Ohio	1310	229	50
W D A Y	Fargo Radio Service Co., Fargo, N. D.	1230	244	50
W G A U	Limb, Marcus G., Wooster, Ohio	1330	226	20
W I A Y	Fox River Valley Radio Supply Co., Neenah, Wis.	1340	224	100
W J A N	Peoria Star Co., Peoria, Ill.	1070	280	100
W R A N	Black Hawk Electrical Co., Waterloo, Iowa	1310	229	20
W T A S	Erbstein, Chas. E., Elgin, Ill.	1090	275	500
K F E R	Auto Electric Service Co., Ft. Dodge, Iowa	1300	231	10

List of 14 Broadcasting Stations Deleted.

Call	Station
W G A T	American Legion, Dept. of Neb., Lincoln, Neb.
K D Z A	Arizona Daily Star, Tuscon, Ariz.
W F A Y	Daniels Radio Supply Co., Independence, Kan.
W B N G	Diamond State Fibre Co., Bridgeport, Pa.
K L B	Dunn, J. J. & Co., Pasadena, Calif.
W I A Z	Electrical Supply Sales Co., Miami, Fla.
K D Z Z	Kinney Bros. & Sipprell, Everett, Wash.
W G A K	Macon Elect. Co., Macon, Ga.
W N A K	Manhattan Radio Supply Co., Manhattan, Kan.
W O Z	Palladium Printing Co., Richmond, Ind.
K Z C	Public Market & Department Stores, Inc., Seattle, Wash.
W S A S	State of Nebraska, Dept. of Agri., Lincoln, Neb.
W P A X	S-W Radio Co., Thomasville, Ga.
W P A V	Tinetti & Sons, Paul, Laurium, Mich.

First Portable Radio Set Using Flashlight Batteries

A COMPACT, self-contained portable radio receiving set which can be carried as easily as a suit case, which requires only flashlight batteries for the filaments of the tubes and which weighs less than 18 pounds, has been perfected by the General Electric Company for the Radio Corporation of America. An outstanding feature of this set, adding to its portability and desirability for camping trips, is the fact that the new radiotrons UV-199 are used which require only 60 milliamperes (.06 amperes) filament current per tube.

This new outfit, known as the Radiola II, will receive radio messages over a range from 200 to 600 meters for a distance as great as any set having a detector and one stage of amplification. It is housed in a mahogany cabinet with hinged front and rear covers. Head telephones with plug attached are clamped on the inside of the front cover. Provision is made in the rear cover for batteries in such a way that they can be easily exchanged. The set is so designed as to make a neat appearance in the home. The front cover can be readily detached.

Radiola II comprises a regenerative receiver with a vacuum tube detector and one stage of audio frequency amplification. The circuit is very efficient and will operate a loud speaker on signals received from nearby stations. With an additional amplifier, it can be used to obtain loud speaker signals from distant stations.

For portable use the filament current is supplied from two 3-cell, 4½ volt flashlight batteries in parallel, and the plate or "B" battery current is supplied by two 22½ volt batteries connected in series. For home use, when weight and portability are not essential, larger batteries for filament and plate current can be used.

An Improved Grimes Reflex Circuit

By W. S. Thompson, E.E.

NOW that winter is over and summer nearly here the radio fan can expect that atmospheric conditions will make receiving difficult. In fact, the author has found that, even at present, disturbance is very noticeable at times, making the use of a loop for picking up signals necessary for good reception. The hook-up given in Fig. 1 is for a reflex circuit, which will enable the user to get a good range even when atmospherics are at their worst.

Since writing the two articles on reflex circuits, published some time ago in RADIO WORLD, I have tried out several new ideas, which have been developed since that time, and have found that the set herein described gives the finest results, and to me is the best reflex I have ever heard. The main points wherein this hook-up differs from those previously described are: The order in which the tubes are used as audio-frequency amplifiers and the method of preventing the tubes from oscillating. It will be noticed that the third tube is used as the third stage of radio-frequency amplification and as the first stage of audio-frequency amplification, while the second tube is the second stage of both audio- and radio-frequency amplification. Credit for this arrangement is due to Mr. David Grimes, of Staten Island, New York, who has developed this method of reflexing signals.

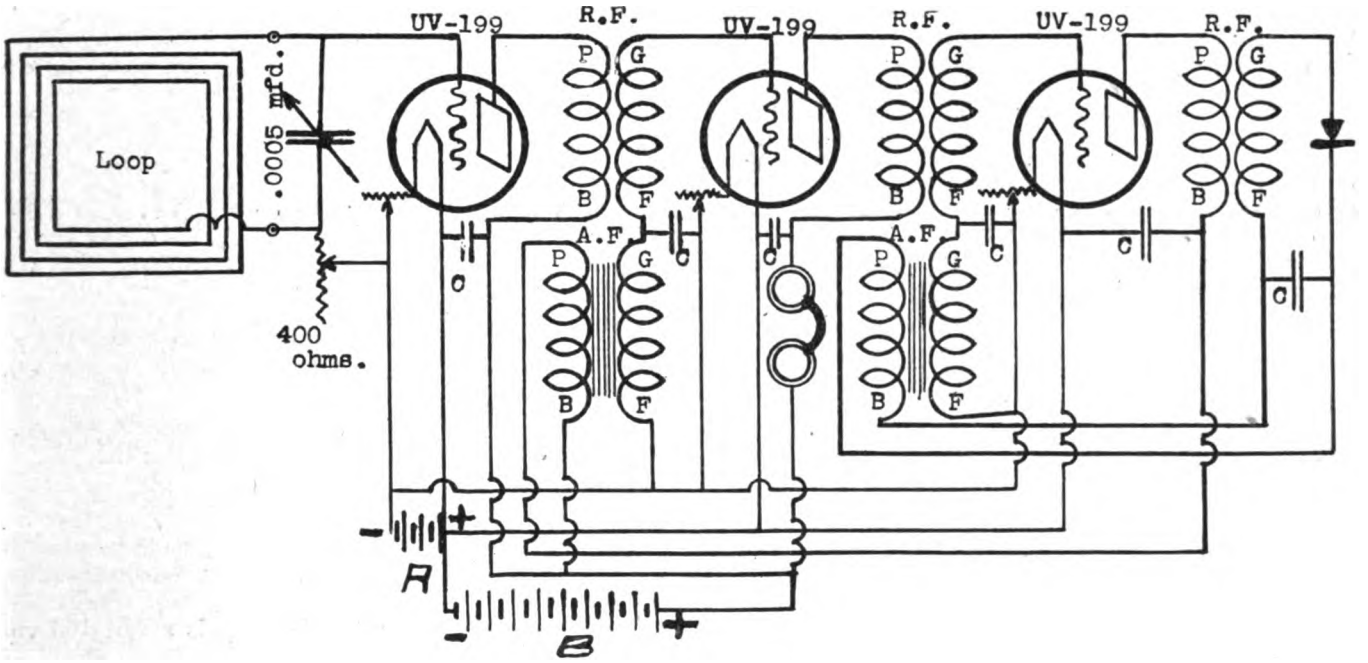

Fig. 1. Hook-up of Mr. Thompson's improved Grimes reflex circuit.

The advantages of this new development are very important when the elimination of static and other forms of interference are considered. It should be noted that any outside noise, such as an induction hum from power lines, will be amplified in audio-frequency through several tubes and then go to the phones in the straight reflex circuit; while in this type there are no stages of audio-frequency amplification in cascade between the loop and the phones. In addition the first stages of radio-frequency amplification tend to strain out any 60-cycle hum which may be picked up by the loop. This fact in itself is a big advantage over the La Tour circuit; but, in addition, there are several other advantages which are equally important. In the previous hook-ups shown any radio-frequency waves which leak through the detector are impressed upon the grid of the first or second tube and are again amplified at radio-frequency. This state of affairs causes the set to oscillate, making stabilization very difficult. It should also be noted that, in the Grimes method, the leakage radio-frequency waves go through only one stage of radio-frequency before going to the detector, thus eliminating a factor which tends to cause the tubes to oscillate, making the set very stable. A third advantage lies in the fact that the heaviest audio-frequency currents are impressed upon the grid of a tube which does not receive the heaviest radio-frequency currents. This equalizes the load carried by each tube, so there is no chance of one tube becoming paralyzed due to an overload.

Still another advantage lies in the way the by-pass condensers are connected, for they by-pass the radio-frequency waves around, not only the audio-frequency transformers, but also the "B" battery. This keeps the audio- and radio-frequency waves more completely separated, and again reduces the tendency towards oscillating tubes. The stabilizer, which consists of a 400-ohm potentiometer connected in the grid circuit of the first tube, will allow the set to pick up local broadcasters without any difficulty, due to oscillating tubes. This means of stabilizing gives an undistorted amplification, which is sometimes difficult to obtain when stabilizing by changing the normal potential of the grid.

A disadvantage of the Grimes circuit, which has been overcome in the hook-up shown in Fig. 1, is that the maximum audio-frequency currents were impressed upon the grid of the first radio-frequency amplifying tube, thus making it less sensitive to weak radio-frequency waves. By placing one stage of pure radio-frequency amplification before the reflex tubes the second tube is better able to amplify both waves. Another advantage lies in replacing the tube detector with the crystal, for, in addition to the advantages of a crystal as a detector, it has a particular advantage in this circuit because the radio-frequency leak-

(*Continued on next page*)

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Radio Personnel in Navy Totals 2,419

By Carl H. Butman

AN exhaustive study of the radio personnel situation in the Navy is now under way both afloat and ashore, in an effort to increase the efficiency of Naval Communications. Some of the less important shore establishments have been closed and the personnel sent to busy stations where shortages existed or to ships at sea which were in need of new operators and experienced radio men.

The training of radio men now in Naval schools is to be pushed, it is understood, with a hope of relieving all shortages by July 1. Previously all third class radio men were at once assigned to fleet work for military training, with the result that the ships-of-war were deprived of a number of higher rates, including first class men and chiefs. This matter is now being adjusted so that some third class men will be assigned to shore duty. In the near future many transfers will be made between the fleets and shore stations to adjust the situation.

On March 31 there were 2,419 radio men in the Naval service, 463 short of the full complement. They included 466 chiefs, 421 first class, 433 second class, and 1,099 third class radio men. In view of the fact that the shortages all occur in the higher rates, over 400 men are now in line for promotion to second class rates or higher, and prospects for their advancement are said to be good. Third class men receive $60 per month; second class, $72; first class, $84, and chiefs from $99 to $126.

At the Navy's five shore radio training stations, 612 men are now undergoing instruction. The largest training school is at Great Lakes, Mich., where over 400 men are studying, the balance of the students being distributed between Hampton Roads and San Francisco, while eight men specializing in sound work are at New London, Conn. The education of these men in modern radio operation and new developments goes on continually, even after they are rated. A recent report from the Charleston district states that study and training in communication instruction and regulations, traffic and text books on several phases of the radio telephone and telegraph arts is carried out daily.

Some idea of what the Navy is trying to achieve in efficiency is gained from a statement of "deficiencies" in communication, which relates that out of 130,942 official messages, not including routine broadcasts for other departments, 26 mistakes were charged to the Naval radio service. These included undue delays, incorrect routing and errors in coding and decoding over a period of eight months.

Catches a Stray Radio Concert

By Will M. Cressy

BEING probably the only he-human-being in the United States over six years old who is not an expert on radio, I do not know whether this happening possesses any interest to you or your readers; but it sure struck me as being strange, to say the least.

At the Orpheum Theatre, Des Moines, Ia., there is a telephone that runs from the stage to the box office. It goes nowhere else; has no connection with any other wires running outside the building.

The other night I took the receiver down from the phone on the stage to call up the box office. And for the next ten minutes we listened to as fine a radio concert as one could wish.

I do not know where it came from, where it was going, or how it got on to that wire. Perhaps you do.

(*Continued from preceding page*)

age through the crystal is very much less than through a tube, hence making the circuit more stable. The advantages of reception in using a loop have been discussed previously, so it will be sufficient to say that static will not interfere with signals as much as when using an outdoor antenna. The loop recommended for this set consists of 20 turns of No. 18 wire wound on a two-foot loop, tuning with a .0005 mfd. condenser.

The best tube to use is the new U.V.-199, which has recently been released for sale. The internal grid-plate capacity of this tube is very small, hence making it well adapted for radio-frequency amplification, and having less tendency to oscillate. When using any tube as an amplifier the best results are usually obtained when the grid is kept negative with respect to the filament. This always holds true if a high plate potential is used, so the filament rheostat of each tube should be connected in the negative lead from the filament battery. By this means the resistance of the rheostat can be used to govern the potential of the grid. When using the U.V.-199 care should be taken that the filament rheostat has enough resistance to prevent excessive currents through the filament.

If a six-volt storage battery is to be used the resistance of the rheostats should be at least 60 ohms, although 30 ohms would be sufficient if three dry cells are used for filament lighting. In hooking up the set the experimenter should note carefully the connections for the by-pass condensers, marked "C" in Fig. 1. These condensers should have a capacity of about .002 mfd. for best results. The correct voltage for the "B" battery is about 100 volts because the tube recommended will give very satisfactory results when this voltage is used. The potentiometer in the grid circuit of the first tube has one terminal connected to the tuning condenser and the other terminal left free, the movable blade being connected to the minus side of the "A" battery, as shown.

All tuning is done with the condenser shunted around the loop, although the 400-ohm potentiometer will have to be adjusted for each station, depending upon the strength of the signal received. The use of separate rheostats for each tube is recommended for two reasons—separate control of filament brilliancy helps to stabilize the set, and because the resistance of the rheostats keeps the grid of all tubes at the proper potential. It will be found that adjustment of the filament current will be more critical with the U.V.-199 than with other hard amplifying tubes, making the use of separate rheostats advisable. Care should be taken in purchasing radio transformers that the wave length range is broad enough to cover the new broadcasting wave lengths recently assigned. It is recommended that the interchangeable type transformer be used so that higher wave lengths can be reached by plugging in a different set of transformers.

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The Radio Mother *By Henry Gillen*

(*Courtesy of the Boston Post*)

We never could educate mother
To give up her old-fashioned way;
A little black bonnet with lavender on it
And a shawl—she was dressed for the day;
The movies she found too exciting
And dances too fancy by far;
She always contended the evening well ended
In making a muffler for pa.

The folks looked too fine at the opera,
The automobile was too fast;
At every new wrinkle her bright eyes would twinkle—
We knew that the die had been cast;
When every one else was out sporting,
And dad had come home from the fights,
We found her there "knittin'" and stroking the kitten,
Until she had put out the lights.

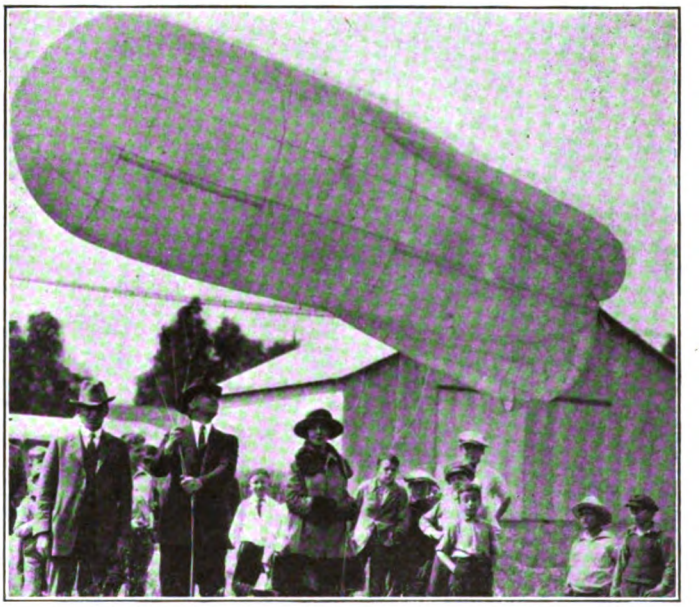
But now when the house is all quiet,
And sewing is hurting her eyes,
She listens to singing the ether is flinging
In mystical waves through the skies;
The crystal receiver won't do her;
She has passed to a triple-tube set,
And has picked up Chicago, but that is not far though;
She hopes to get Seattle yet.

Standard Radio Waves To Be Transmitted from Washington, D. C.

THE Bureau of Standards at Washington, D. C., (Station WWV), transmitted radio signals of standard frequency on the evenings of May 1 and May 7, starting at 11:00 p. m., Eastern Standard Time. The range of frequencies was from 500 to 1,000 kilocycles, corresponding to 600 to 300 meters. It is expected that within the next few weeks higher frequencies will be transmitted to include the waves used by amateurs. These standard frequency signals are intended to be used for standardizing wave meters and adjusting transmitting and receiving apparatus. The proper adjustment of such apparatus is particularly important in connection with the re-allocation of waves as recommended by the Second Radio Conference held in Washington in March, 1923. Considerable interest has been shown in other schedules of such signals which have been transmitted recently from WWV. The schedule of the transmission for both evenings is given below:

Time	Signal	Frequency, Kilocycles per Second	Approximate Wave Length, Meters.
11:00 to 11:04 p.m.	General Call	500	600
11:04 to 11:08 p.m.	Standard Frequency		
11:08 to 11:11 p.m.	Announcement		
11:15 to 11:19 p.m.	General Call	600	500
11:19 to 11:23 p.m.	Standard Frequency		
11:23 to 11:26 p.m.	Announcement		
11:30 to 11:34 p.m.	General Call	700	428
11:34 to 11:38 p.m.	Standard Frequency		
11:38 to 11:41 p.m.	Announcements		
11:45 to 11:49 p.m.	General Call	800	375
11:49 to 11:53 p.m.	Standard Frequency		
11:53 to 11:56 p.m.	Announcement		
12:00 to 12:04 a.m.	General Call	900	333
12:04 to 12:08 a.m.	Standard Frequency		
12:08 to 12:11 a.m.	Announcement		
12:15 to 12:19 a.m.	General Call	1,000	300
12:19 to 12:23 a.m.	Standard Frequency		
12:23 to 12:26 a.m.	Announcement		

The "general call" was given by voice during the first half of the four minute period and by continuous wave telegraph during the second half. This was done to enable listeners to tune in WWV. The "standard frequency signals" consisted of the call letters WWV (. — — . — — . . . —) repeated with very long dashes intervening and were transmitted by unmodulated continuous waves. The "announcements" were made by voice during the first half of the period and by CW telegraphy during the latter half. The general call and the announcements were on the same frequency as the standard frequency signals. Details regarding the utilization of these signals may be obtained upon application to the Bureau of Standards.



(C. P. and A. Photos)

R. W. Coburn and Roy Knabenshue, the aeronautical expert, recently constructed a model balloon on which to suspend their antenna, thus eliminating many disturbances, they claim. The balloon is 14 feet long and holds 150 cubic feet of hydrogen gas.

Coming! New List of Broadcasters!

While the Department of Commerce has assigned wave lengths for each of the broadcasting zones established by the recent Second National Radio Conference, individual assignments of station wave lengths have not been completed. They are being arranged as rapidly as possible and as soon as finished A COMPLETE, UP-TO-DATE LIST OF BROADCASTERS will be published by RADIO WORLD.

The allocation of wave lengths for 16 new Class A stations appears in this issue of RADIO WORLD.

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To Use Kilocycles For Designating Radio Waves

THE Second National Radio Conference, which met with Secretary Hoover in March, introduced a method of designating radio waves which is somewhat new to the radio public. This is the use of frequency in kilocycles (abbreviated kc) instead of wave length in meters. The advantages of this practice have been familiar to radio engineers for some time, and it is probable that it will eventually replace the use of wave length in meters. As a matter of fact, wave length is a somewhat artificial conception in the handling of radio apparatus and is one of the difficult things for the beginner to understand. The frequency of the radio wave is the same as the frequency of the alternating current which flows in the radio transmitting or receiving set.

As often happens in technical matters, the idea of "kilocycles" is simpler than the forbidding aspect of the word suggests. "Kilo" means a thousand, and "cycle" means one complete alternation. The number of kilocycles indicates the number of thousands of times that the rapidly alternating current repeats its flow in either direction in the antenna in one second. The smaller the wave length in meters, the larger is the frequency in kilocycles.

The reason that kilocycles are coming into use and displacing meters is that the necessary separation of the frequency of transmitting stations to prevent interference is the same, no matter what the frequency may be. This necessary separation is variable and quite misleading when expressed in meters. Thus the number of radio messages that can be transmitted simultaneously without interference can be correctly judged from the kilocycles but not from the meters. For example, the amateurs will in the future work in a band of wave lengths from 150 to 200 meters, but this is a frequency band from 2000 to 1500 kilocycles. This is an enormously wider band when considered from the viewpoint of kilocycles than, for example, the band having the same width in meters from 1000 to 1050 meters, which is 300 to 286 kilocycles. While it is possible to carry on fifty simultaneous radio telephone communications between 150 and 200 meters, only one could be carried on between 1000 and 1050 meters.

In accordance with the recommendation of the Second National Radio Conference, the Department of Commerce and other Government departments will hereafter follow the practice of specifying in even values of kilocycles rather than meters. The conference recommended the practice of expressing wave frequency in kilocycles per second with wave length in meters in parentheses thereafter. The relation between the two is very simple. To obtain kilocycles, divide 300,000 by the number of meters; to obtain meters, divide 300,000 by the number of kilocycles. For example, 100 meters=approximately 3000 kilocycles, 300 meters=1000 kilocycles, 1000 meters=300 kilocycles, 3000 meters=100 kilocycles. The accompanying table may be used for rapid and accurate conversion either from kilocycles to meters or meters to kilocycles.

For highly accurate conversion the factor 299,820 should be used instead of 300,000. The table herewith gives accurate values of kilocycles corresponding to any number of meters and vice versa. It should be particularly noticed that the table is entirely reversible; that is, for example, 50 kilocycles is 5996 meters and also 50 meters is 5996 kilocycles. The range of the table is easily extended by shifting the decimal point.

KILOCYCLES TO METERS, OR METERS TO KILOCYCLES

10	29980	490	611.9	970	309.1	1450	206.8	1930	155.3
20	14990	500	599.6	980	306.0	1460	205.4	1940	154.5
30	9994	510	587.9	990	302.8	1470	204.0	1950	153.8
40	7496	520	576.6	1000	299.8	1480	202.6	1960	153.0
50	5996	530	565.7	1010	296.9	1490	201.2	1970	152.2
60	4997	540	555.2	1020	293.9	1500	199.9	1980	151.4
70	4283	550	545.1	1030	291.1	1510	198.6	1990	150.7
80	3748	560	535.4	1040	288.3	1520	197.2	2000	149.9
90	3331	570	526.0	1050	285.5	1530	196.0	2010	149.2
100	2998	580	516.9	1060	282.8	1540	194.7	2020	148.4
110	2726	590	508.2	1070	280.2	1550	193.4	2030	147.7
120	2499	600	499.7	1080	277.6	1560	192.2	2040	147.0
130	2306	610	491.5	1090	275.1	1570	191.0	2050	146.3
140	2142	620	483.6	1100	272.6	1580	189.8	2060	145.5
150	1999	630	475.9	1110	270.1	1590	188.6	2070	144.8
160	1874	640	468.5	1120	267.7	1600	187.4	2080	144.1
170	1764	650	461.3	1130	265.3	1610	186.2	2090	143.5
180	1666	660	454.3	1140	263.0	1620	185.1	2100	142.8
190	1578	670	447.5	1150	260.7	1630	183.9	2110	142.1
200	1499	680	440.9	1160	258.5	1640	182.8	2120	141.4
210	1428	690	434.5	1170	256.3	1650	181.7	2130	140.8
220	1363	700	428.3	1180	254.1	1660	180.6	2140	140.1
230	1304	710	422.3	1190	252.0	1670	179.5	2150	139.5
240	1249	720	416.4	1200	249.9	1680	178.5	2160	138.8
250	1199	730	410.7	1210	247.8	1690	177.4	2170	138.2
260	1153	740	405.2	1220	245.8	1700	176.4	2180	137.5
270	1110	750	399.8	1230	243.8	1710	175.3	2190	136.9
280	1071	760	394.5	1240	241.8	1720	174.3	2200	136.3
290	1034	770	389.4	1250	239.9	1730	173.3	2210	135.7
300	999.4	780	384.4	1260	238.0	1740	172.3	2220	135.1
310	967.2	790	379.5	1270	236.1	1750	171.3	2230	134.4
320	936.9	800	374.8	1280	234.2	1760	170.4	2240	133.8
330	908.6	810	370.2	1290	232.4	1770	169.4	2250	133.3
340	881.8	820	365.6	1300	230.6	1780	168.4	2260	132.7
350	856.6	830	361.2	1310	228.9	1790	167.5	2270	132.1
360	832.8	840	356.9	1320	227.1	1800	166.6	2280	131.5
370	810.3	850	352.7	1330	225.4	1810	165.6	2290	130.9
380	789.0	860	348.6	1340	223.7	1820	164.7	2300	130.4
390	768.8	870	344.6	1350	222.1	1830	163.8	2310	129.8
400	749.6	880	340.7	1360	220.4	1840	162.9	2320	129.2
410	731.3	890	336.9	1370	218.8	1850	162.1	2330	128.7
420	713.9	900	333.1	1380	217.3	1860	161.2	2340	128.1
430	697.3	910	329.5	1390	215.7	1870	160.3	2350	127.6
440	681.4	920	325.9	1400	214.2	1880	159.5	2360	127.0
450	666.3	930	322.4	1410	212.6	1890	158.6	2370	126.5
460	651.8	940	319.0	1420	211.1	1900	157.8	2380	126.0
470	637.9	950	315.6	1430	209.7	1910	157.0	2390	125.4
480	624.8	960	312.3	1440	208.2	1920	156.2	2400	124.9
2410	124.4	2930	102.3	3400	76.88	4540	60.69	7450	40.24
2420	123.9	2940	102.0	3420	76.45	4560	60.45	7500	39.98
2430	123.4	2950	101.6	3440	76.10	4580	60.20	7550	39.71
2440	122.9	2960	101.3	3460	75.71	4600	59.96	7600	39.45
2450	122.4	2970	100.9	3480	75.33	4620	59.37	7650	39.19
2460	121.9	2980	100.6	3500	74.96	4640	58.79	7700	38.94
2470	121.4	2990	100.3	3520	74.58	4660	59.22	7750	38.69
2480	120.9	3000	99.94	3540	74.21	4680	57.66	7800	38.44
2490	120.4	3020	99.28	3560	73.85	4700	57.11	7850	38.19
2500	119.9	3040	98.62	3580	73.49	4720	56.75	7900	37.95
2510	119.5	3060	97.98	3600	73.13	4740	56.04	7950	37.71
2520	119.0	3080	97.34	3620	72.77	4760	55.52	8000	37.48
2530	118.5	3100	96.72	3640	72.42	4780	55.01	8050	37.25
2540	118.0	3120	96.10	3660	72.07	4800	54.51	8100	37.02
2550	117.6	3140	95.48	3680	71.73	4820	54.02	8150	36.79
2560	117.1	3160	94.88	3700	71.39	4840	53.54	8200	36.56
2570	116.7	3180	94.28	3720	71.05	4860	53.07	8250	36.34
2580	116.3	3200	93.69	3740	70.71	4880	52.60	8300	36.12
2590	115.8	3220	93.11	3760	70.38	4900	52.14	8350	35.91
2600	115.3	3240	92.54	3780	70.05	4920	51.69	8400	35.69
2610	114.9	3260	91.97	3800	69.73	4940	51.25	8450	35.48
2620	114.4	3280	91.41	3820	69.40	4960	50.82	8500	35.27
2630	114.0	3300	90.86	3840	69.08	4980	50.39	8550	35.07
2640	113.6	3320	90.31	3860	68.77	5000	49.97	8600	34.86
2650	113.1	3340	89.77	3880	68.45	5050	49.56	8650	34.66
2660	112.7	3360	89.23	3900	68.14	5100	49.15	8700	34.46
2670	112.3	3380	88.70	3920	67.83	5150	48.75	8750	34.27
2680	111.9	3400	88.18	3940	67.53	5200	48.36	8800	34.07
2690	111.5	3420	87.67	3960	67.22	5250	47.97	8850	33.88
2700	111.0	3440	87.16	3980	66.91	5300	47.59	8900	33.69
2710	110.6	3460	86.65	4000	66.63	5350	47.22	8950	33.50
2720	110.2	3480	86.16	4020	66.33	5400	46.85	9000	33.31
2730	109.8	3500	85.66	4040	66.04	5450	46.48	9050	33.13
2740	109.4	3520	85.18	4060	65.75	5500	46.13	9100	32.95
2750	109.0	3540	84.70	4080	65.46	5550	45.77	9150	32.77
2760	108.6	3560	84.22	4100	65.18	5600	45.43	9200	32.59
2770	108.2	3580	83.75	4120	64.90	5650	45.09	9250	32.41
2780	107.8	3600	83.28	4140	64.62	5700	44.75	9300	32.24
2790	107.5	3620	82.82	4160	64.34	5750	44.42	9350	32.07
2800	107.1	3640	82.37	4180	64.06	5800	55.09	9400	31.90
2810	106.7	3660	81.92	4200	63.79	5850	43.77	9450	31.73
2820	106.3	3680	81.47	4220	63.52	5900	43.45	9500	31.56
2830	105.9	3700	81.03	4240	63.25	5950	43.14	9550	31.39
2840	105.6	3720	80.60	4260	62.99	7000	42.83	9600	31.23
2850	105.2	3740	80.17	4280	62.72	7050	42.53	9650	31.07
2860	104.8	3760	79.74	4300	62.46	7100	42.23	9700	30.91
2870	104.5	3780	79.32	4320	62.20	7150	41.93	9750	30.75
2880	104.1	3800	78.90	4340	61.95	7200	41.64	9800	30.59
2890	103.7	3820	78.49	4360	61.69	7250	41.35	9850	30.44
2900	103.4	3840	78.08	4380	61.44	7300	41.07	9900	30.28
2910	103.0	3860	77.67	4400	61.19	7350	40.79	9950	30.13
2920	102.7	3880	77.27	4520	60.94	7400	40.52	10000	29.98

Table giving translation of kilocycles into meters and meters into kilocycles.

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New Tube Operates From a Flashlight Battery

By C. H. Huntley

A RADIO tube which is claimed to consume 70 per cent. less current than any of the small or so-called peanut variety now being sold and the first to operate with the filament current supplied from the ordinary flashlight battery, has been perfected by the General Electric Company. It will be known as the UV-199. This new type radiotron has the X-L tungsten filament. The filament wire is extremely small, being but one-fourth the diameter of an ordinary hair. This new filament is considered practically ideal. It has the high efficiency of electron production of the coated filament and the uniformity of operation and ruggedness of the tungsten filament. It has the quietness of operation of the coated filament and a lower operating temperature than the old tungsten filament. It has the long length of the coated filament and the long life of the tungsten filament.

The wattage consumed by the filament of this tube is .18, or approximately but 1/27 of the energy used in the UV-201 tube. Yet the characteristics when used in a radio set are slightly better. The filament runs at a temperature about 400 degrees cooler than the old type of radiotron tube.

This radiotron might almost be termed "the tube with nine lives" because if the filament is operated at too high a temperature the electron emission falls off and the tube becomes inoperative. However, by operation at rated voltage with the plate voltage off for a period of time normal electron emission can be regained. The length of time required to perfect this recovery is proportional to the length of time at which the tube was operated at abnormally high filament voltage. This does not mean that for uniformly satisfactory results careful adjustment of filament voltage is not essential. It does mean, however, that improper filament operation does not spoil the tube beyond recovery. This tube is an excellent radio-frequency amplifier, because the capacity between elements is lower than that of the UV-201-A tube.

Although the base is of the same general design as the standard four-prong base, it is of smaller diameter and the arrangement of the leads to the contact pins is different, the grid and plate contact pins being opposite rather than adjacent. This has been done to facilitate wiring and simplify connections in a multi-tube set.

This tube operates satisfactorily in all circuits which were used with the old UV-201 tube and should give slightly superior results, especially in radio-frequency amplification. Constant voltage operation of the filament is recommended. However, constant current operation does not entail the serious loss of life that followed constant current operation in the old tungsten filaments.

Work on the filament in the new tube has been going on in the Research Laboratory of the General Electric Company for more than eight years.

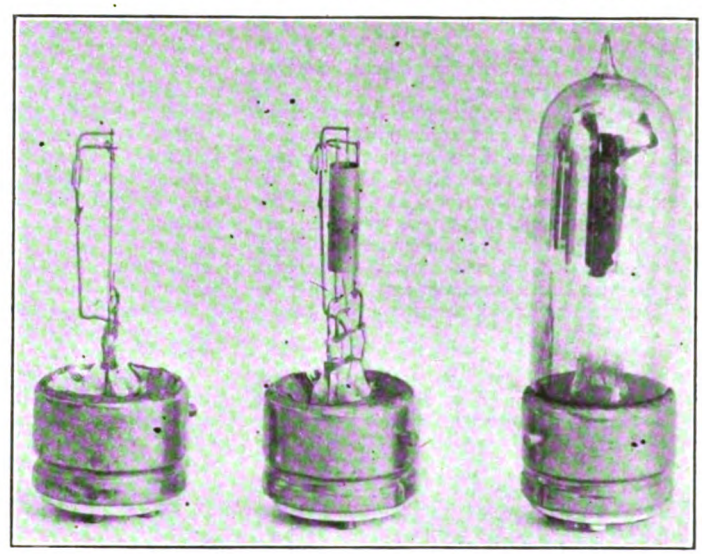
The UV-199 tube requires so little filament energy that the ordinary No. 6 dry cells give remarkably long service. For instance, three No. 6 dry cells in series will operate one of the UV-199 tubes one hour a day for a whole year. On a three-tube set three No. 6 dry cells will operate the tubes one hour per day for a period of over four months.

In the case of portable sets using three-cell flashlight batteries, it is recommended by the makers that one set of three flashlight cells be used for each tube in the set. It is immaterial whether each tube is wired separately to one of the batteries or whether they are all placed in parallel, provided separate rheostat control is made for each tube. If this is not employed for each tube and only a common rheostat provided the batteries should be connected in parallel.

In common with all receiving tubes, there are certain precautions which should be observed in order to obtain satisfactory results.

The proper grid bias must be used, depending in amount upon the plate voltage employed. Under certain conditions of small interference, slight static and weak signals, a grid leak resistance as high as six to ten megohms can be employed with success. With strong signals and heavy interference a lower grid leak resistance down to possibly two megohms should be used.

It should be understood that this UV-199 tube will not deliver the energy as an amplifier that the UV-201-A will. The UV-201-A is a remarkably powerful tube and has electron emission, mutual conductance and amplification far above any other receiving tube. It must not be expected that with a filament expenditure of only .18 watt that as powerful results can be obtained as an amplifier as with the expenditure of 1.25 watts.



Details of new and efficient tube which operates from a flashlight battery.

On account of the low filament current required by this tube it is essential to have the filament rheostat of sufficient resistance. For operation from three dry cells, the filament rheostat resistance should be at least thirty ohms per tube. If a six-volt storage battery is used, the resistance should be at least sixty ohms. In multi-tube sets the sockets for the tubes should be cushion mounted so as to minimize the effect of vibration.

With any vacuum tube, and particularly with the UV-199 tube, the changing of connections or adjustments of the wiring of the set is dangerous unless the tubes are removed from the sockets or the "B" batteries entirely disconnected. Inasmuch as many adjustments can most advantageously be made while the set is in operation, it is strongly recommended that a protective resistance be placed in one lead of the plate battery, preferably immediately next to one battery terminal. An almost ideal resistance for this purpose is a 10-watt 110-volt tungsten lamp. The UV-199 has just been placed on the market by the Radio Corporation of America.

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Answers to Readers of Radio World

In regard to the reflex circuit described by Mr. C. White in RADIO WORLD *for Feb. 17, will WD-11 tubes work satisfactorily in this set? What make audio-frequency transformer will work best?—Dr. J. T. Shadburne, Butler, Mo.*

These tubes will work in the circuit you mention, but for volume would advise using a tube such as the U. V. 201 or U. V. 201A. Any good make of transformer will do. It is of the utmost importance in the construction of any set, and reflex sets especially, that only the best of material be incorporated. Cheap apparatus gives poor results.

* * *

When using the WD-11 as an amplifier is it necessary to put a protective fuse in the plate circuit? Will fuses in the phone lead prevent signals from coming through? Will they prevent the phones from burning out if I use 60 volts on my plate? Is 60 volts too much to use on these tubes?—Wm. Jackson, Charlotte, N. C.

It is not necessary to put protective fuses in the plate circuit as the current flowing is so small. Fuses in your phone leads should not stop you from hearing signals, but the fact that you are using 60 volts in the plate circuit should not cause you to put fuses in, unless you anticipate short circuiting your plate battery across the phones. These particular tubes will stand up to 100 volts on the plate without harming the tube. We do not understand why you want to use protective fuses in the plate circuit. They are used in the filament circuit to prevent the filament from burning out should you accidenly short circuit the B battery across the A battery leads.

* * *

I would like to get blue prints of several sets you have described in RADIO WORLD. *Will you kindly advise me how I may do so?—Frank H. Dunster, 32 West 98th Street, New York City.*

RADIO WORLD does not publish blue prints of sets, panel layouts or circuits, unless definitely so stated by the writer in the article. If the latter is the case, you may address a letter to him care of RADIO WORLD and it will reach him.

* * *

I have constructed the set described by Arthur S. Gordon in RADIO WORLD *for April 14 and cannot get anything outside of WEAF, although with a Reinartz hook-up using Murdon 1½ volt tubes I get WOC. What can be the trouble?—Maurice C. Eddy, 2551 Bedford Ave., Brooklyn, N. Y.*

There is no reason why if you have this set hooked up correctly you cannot get better results. This is not a new hook-up, but one that has been tested out. It is the single circuit regenerative using the rotor as a tickler. Go over your wiring very carefully, making sure of each connection. You should get as good results with this set as you do with your other. Make sure of your connections and examine your condensers and grid leak.

* * *

Can WD-11 tubes be repaired? Are there any good filament protectors on the market? —Henry Eisminger, Pulaski, Ia.

Yes, these tubes can be repaired. The best filament protectors are the small fuses, either the type that fit over the projecting lug of the tubes, or the telephone type. The last mentioned can be bought at any electrical supply store that deals in telephone parts. A good way in which to prevent trouble is to put an ordinary 60 or 75 watt electric lamp in series with the B battery leads as a ballast lamp. This will allow the B battery to operate the circuit, but will prevent the filament from burning out should your B leads accidently cross the filament circuit.

* * *

I intend using the regular three circuit regenerative circuit with three steps of audio-frequency amplification. Is this too much, or could more be used?—R. L. Halman, 22 Lawrence St., Watervliet, N. Y.

You can use three steps of audio-frequency amplification, but the distortion and noise will be so great that it will hurt the signals more than help them. With the regular three circuit regenerative set, two steps of amplifications are generally sufficient for any one's needs. It is better to employ one stage of audio and a power amplifier, to obtain volume of signals than it is to use too many steps of single amplification.

* * *

In RADIO WORLD *for Feb. 17 you published a circuit by G. W. May. How far will I be able to receive on this set, using a 150 foot antenna, 50 ft. high?—Gene Ullemeyer, 1511 Ninth Ave., Rock Island, Ill.*

It is impossible accurately to state the receiving range of any receiver, as there are too many other outside conditions upon which reception depends. However, it might be said that using a single circuit receiver of somewhat the same design, distances of 1,800 to 2,200 miles have been covered.

* * *

I recently built one of the three tube sets described by W. S. Thompson in his article entitled "Multi-tube Reflex Circuits" and had wonderful success with it until just last week, when it started in to get weaker and weaker, and finally hardly responded to the signals at all. I notice that it seems to work for a few minutes evenings, then stops, or rather slows down. I have been over the wiring and cannot find any trouble.—Jack Taylor, Jr., Winchester, Ky.

From your description it would seem that your B batteries are going dead and we advise that you put in new ones. If you are using a crystal detector, clean it with a stiff brush and carbon bi-sulphide (carbona) occasionally, as the dust lessens the efficiency of the crystal.

* * *

In RADIO WORLD *for March 17 you published a hook-up for a one-tube super-regenerative set by W. S. Thompson. It works wonderfully, but I would like to increase the volume by the addition of amplification. What apparatus would I need to do it, and where could I obtain the diagram? —L. Roon, M. Sc., 1328 Broadway, New York City.*

The easiest way in which to increase the volume of signals in this circuit will be by adding additional audio-frequency amplification. The apparatus necessary for two stages of amplification will be two transformers, two sockets and tubes, two rheostats, panel, double and single circuit jack, extra B batteries and filament batteries. The hook-up you should use was published in RADIO WORLD for March 31, page 26. You can experiment with the grid leak in this circuit as it is a super-regenerative circuit and you might use the leak to advantage in your tuning.

(*Continued from page 7*)

the end of the inductance coil and the positive terminal of the "B" batteries.

I have left the layout dimensions of the panel to the constructor, in view of the fact that there are many different types of instruments, each requiring different spacing and drilling. It is only a matter of good judgment.

The wiring of the outfit is exceedingly simple and the average amateur will have no difficulty. See the accompanying diagram.

In spite of the fact that the microphone is in the ground circuit it modulates quite well. If it should heat, remove the back part so as to allow air to pass on the diaphragm. With a little experimenting the tuning of the outfit will be found to be quite easy.

To beginners who decide to build this outfit, it might be well to mention some of Uncle Sam's requirements for radio transmitting outfits and their operators. In the first place, all operators must be licensed. These can be secured from the Radio Inspectors located at the Custom Houses in the following cities: Boston, New York, Baltimore, Savannah, New Orleans, San Francisco, Seattle, Cleveland and Chicago. Write to your nearest inspector, who will send you the necessary papers.

To obtain a license the amateur must have a fair knowledge of the code, and must be familiar with the United States laws controlling radio.

Amateurs must not transmit on a wave length greater than 200 meters. The wave length of a transmitting outfit depends upon the antenna used. After you have constructed this outfit, if you do not know the wave length of your antenna, send its measurements (length, height, etc.), to the Editor of RADIO WORLD.

The simplicity in construction, the small cost, the simplicity and efficiency in operation, the compactness and neatness in appearance of this outfit, all make me feel confident that it will meet the approval of many fans. Of course, the advanced radio man might suggest several improvements, but simplicity was the author's object in designing this outfit for the radiophone beginner.

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How to Obtain Vernier Control Using a 43-Plate Condenser

By J. E. Anderson

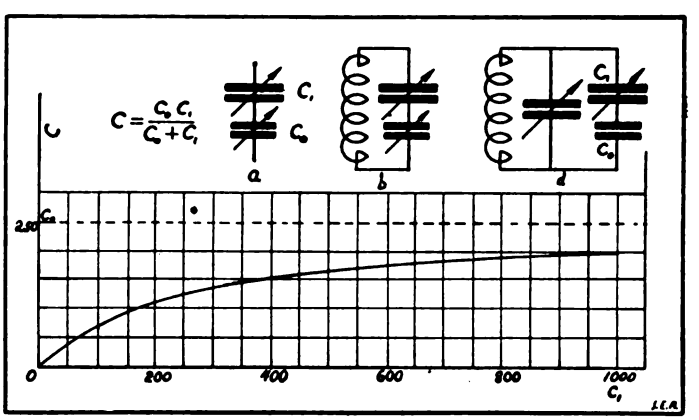
IT is not generally appreciated among amateurs and experimenters that an ordinary 23-plate or 43-plate condenser may be used as a vernier to obtain a very fine adjustment of capacity. But this may be done if two condensers are available, and the vernier action may be made extremely fine. It is based on the properties of two condensers connected in series, one of which is small in comparison with the other.

Suppose two condensers C_0 and C_1, Fig. a in the accompanying drawing, are connected in series. The capacity of this series combination as measured across the terminals is given by the product of the two divided by their sum; or expressed algebraically, $C = \frac{C_0 C_1}{C_0 + C_1}$, where C is the capacity of the two in series. The curve in the drawing shows how the value of C varies as the larger of the two is increased. In this particular curve the value of C_0 is 250 micromicrofarads. It is seen that at first the value of C increases at a fairly rapid rate, but as C_1 becomes large in comparison with C_0 there is not much change in C for large changes in the large condenser. In fact the vernier action of the large condenser may be considered to start as soon as C_1 becomes equal to C_0. The value of C is always less than the smaller of the two and approaches it assymptotically, as is shown by the dotted line in the drawing.

This property of condensers connected in series is often encountered in single circuit tuners and is erroneously attributed to broad tuning. The statement that the tuning is so broad that the signals come in all over the condenser is often heard. The trouble is that the condenser is merely a vernier and the only remedy is to increase the antenna inductance. The self capacity of the antenna is effectively in series with the tuning condenser. As long as the capacity of the tuning condenser is smaller than the self capacity of the antenna it is effective in tuning, but as soon as it becomes larger than the antenna capacity the vernier action begins and the condenser becomes useless in tuning.

A method of making use of this vernier action for fine tuning in a selective circuit is shown in Fig. b of the drawing. The series combination is connected across the tuning coil. The condenser C_0, which may have a capacity of 500 micromicrofarads, is used for approximate tuning and the larger condenser C_1 for final adjustment. First set the large condenser on division 90, or thereabouts, and tune as near as possible with the other condenser. Then the large condenser may be used as a vernier for final tuning.

A better way is shown in Fig. d. The series combination is here connected in parallel with the main tuning condenser. This arrangement is capable of extremely fine adjustment. In this case condenser C_0 may be a small fixed condenser with either air or mica dielectric, and C_1 a variable condenser many times as large as C_0 when set for maximum capacity. The smaller C_0 is in comparison with C_1 the finer the adjustment will be. For instance if the value of C_0 is 50 micromicrofarads and the maximum value of C_1 is 1000, the maximum capacity of the series combination will be 47.6 micromicrofarads, while the change



Diagrams illustrating Mr. Anderson's methods of obtaining vernier control with a 43-plate condenser.

in this due to a change of one division of the large condenser will be .013 micromicrofarad. A finer variation will hardly ever be necessary in a radio receiving circuit. If the total capacity in the tuned circuit is 500 micromicrofarads this would represent a change in the frequency to which the circuit would respond of only 9.75 cycles per second, or a change in the wavelength of only half a centimeter. If such fine adjustment is not needed the variable condenser C_1 may be made smaller or the fixed condenser larger. A good combination would be an 11-plate variable and a fixed condenser of 50 micromicrofarads capacity.

Watch Your Wave Length—The Inspector Does!

WHEN people mention casually to one another that WJZ's wave length is to be changed, they little realize that it means more than the mere turning of a switch, or increasing or decreasing of power.

When a station's wave is to be measured, there is one authority which the owner can consult. That is the radio inspector of the district. And who keeps check on the radio inspectors? Daily there is sent out from the Bureau of Standards, Washington, D. C., a series of standard waves, by which the inspectors' wave meters are accurately checked by the zero beat method. The wave meters used are of the heterodyne type and the daily checking from Washington makes absolute accuracy possible.

Now that the broadcasting stations have received reallocated wave lengths, there were many things that had to be considered. One of them was to see that the station's wave was sharp and did not slop over into the next wave length. Once the wave has been assigned and checked no deviation will be allowed, and if there is and no attention is paid to it, the station license will be revoked. Strict adherence to time schedule is also absolutely necessary.

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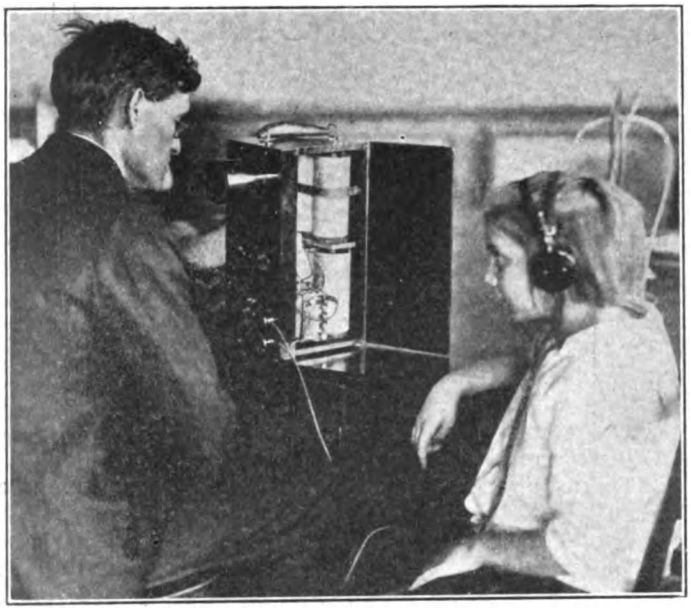
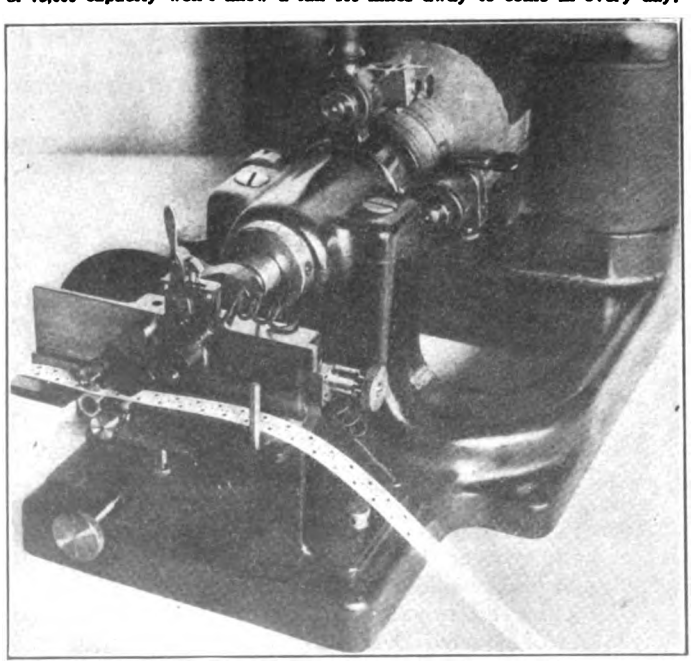


(C. Wide World Photos)

Nowadays they are employing audio-frequency amplifiers for many other things than radio. Besides using cascade amplification along long-distance lines, and power amplification in speeches, they are teaching the deaf to hear. The illustration shows Mr. Kilgour, radio expert, proving that by means of powerful amplifiers utilizing the radio principle he can make deaf children hear.

(C. Fotograms, N. Y.)

Now that they are building new ball parks and giving the mighty Yanks a chance to do some tall ball playing on their own grounds, they have to keep the public informed by radio as to the results, as even a ball park of 75,000 capacity won't allow a fan 100 miles away to come in every day.



(C. International Newsreel Photos)

Photo of Major General Squier's new code device by means of which the present Morse and International code is made faster and easier. In this new system dots, dashes and spaces are differentiated by varying intensities of the sinsuodial wave employed.

"They Can't Get Away, They Can't Get Away, From

Captions by Robt. L. Dougherty

Radio Aids Army Recru

(C. P. & A. Photos)

THE United States Army Recruiting Service recently hit on a novel and up-to-date method of recruiting men for the Signal Corps of the army. Three officers of the service set up the powerful receiving and transmitting equipment of station BG4 in Herald Square, 33rd Street and Broadway, New York City, and by its aid collected a goodly crowd in less than no time.

With the aid of this powerful apparatus, which included a fine loud speaker, a crowd quickly gathered and threatened to stop all traffic. The apparatus is the regulation Signal Corps field apparatus, which is

(C. Fotograms, N. Y.)

The latest development in radio occurred when a typewritten message was transmitted from a moving airplane to a receiving station below at Anacostia, Washington, D. C. The instrument uses the new "teletype" instrument, a device similar to that used in the line telegraph but necessarily accommodated to radio and thus modified for that purpose.

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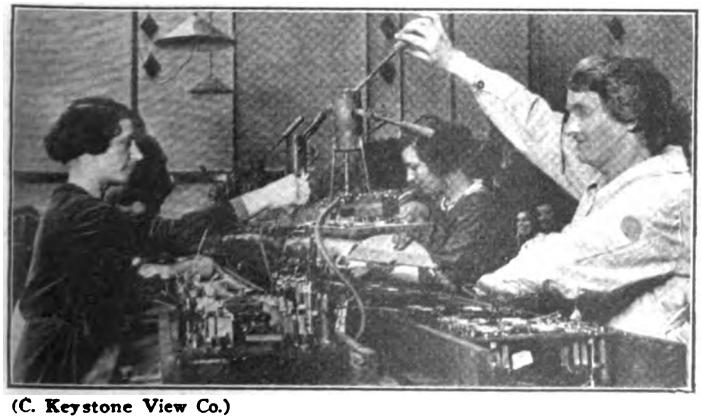
"Get Away, From the Camera Men"

ert L. Dougherty

my Recruiting

a combined receiver and transmitter in a small cabinet. From the curious onlookers came several queries as to "What is that thing?" When told they immediately became interested and many recruits enlisted.

The use of radio to attract a crowd is not new, as many others have used it before, but the use of it to enlist men in this department of the army, is something that promises to be a big thing. People do not think of these things until they are forcibly brought to their notice and setting up a complete station in the midst of New York's busiest section is about the most forcible method that could be employed.



(C. Keystone View Co.)

The radio manufacturing industry is increasing by leaps and bounds in England. They employ girls to do the finer work as they do in America. The illustration shows a British factory at Chelmsford. The girls are soldering receiving equipment. [illegible]nd over a salesman for electric

(C. P. & A. Photos)

Six-year-old Verner Alexanderson, who was kidnapped and found within four days by the aid of radio, and his father, E. F. W. Alexanderson, chief engineer of the Radio Corporation of America. A nation-wide hunt was made for the boy by the aid of wireless. His frightened abductors abandoned him and the youngster was returned by the woman in whose care he had been left.

(C. Underwood and Underwood)

In the Boys' Parade down Fifth Avenue, New York City, last week, they equipped the buses with radio receiving sets. The illustration shows the boys of P. S. 5, Manhattan, and their radio equipped "touring car."

(C. Photopews)

In these days it is rather out of date to celebrate your birthday with cake and candles, especially when the cake would have to have 110 candles on it, so Alta Stirt, of the Brooklyn Home for the Aged, celebrated by

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR BUSY READERS

"The Radio Wave" is the name of a neat little monthly published by the Charleston, S. C., Radio Club. The editor is K. C. Parsons, who is also secretary of the club. His address is 278 King Street, Charleston, S. C.

* * *

A hit was made by the San Francisco electrical contractors recently when they staged an amateur play called "While There Is Credit There Is Hope." It was received enthusiastically—and there were radio men in the audience, too.

* * *

Radio standardization has been assigned by the American Engineering Standards Committee to the Institute of Radio Engineers and the American Institute of Electrical Engineers jointly. This is in accordance with the recommendations of the Bureau of Standards.

* * *

The Bureau of Standards has issued Circular No. 138 entitled "A Decimal Classification of Radio Subjects—an Extension of the Dewey System." The literature of radio has become so prolific that such a system of indexing seems to be a real necessity, especially for libraries.

* * *

The rate war now in progress between the cable companies and radio companies handling traffic across the Atlantic renders doubtful the consummation of the American plan for the allocation of the former German cables in the Atlantic. The situation has caused the cable companies to delay new construction.

* * *

Dr. A. S. W. Rosenbach, the noted authority, who spent $1,250,000 for rare books abroad, returned to New York recently on the White Star liner "Olympic." On the way across Dr. Rosenbach said he evoked the medium of the radio to successfully negotiate the purchase of a Gutenberg Bible from James W. Ellsworth, of New York City.

* * *

Listening in on radio is now all the rage in France, and the ranks of the devotees are growing rapidly. Recently the broadcasting stations asked their listeners to send in their names, and the census showed more than 50,000 "fans" at 12,000 receiving posts. The production of wireless sets has developed greatly and the fine equipment produced in France is gaining renown.

The Fisheries Bureau of the Government issued a broadcast last week giving wholesale market prices on fish, together with the quantity of varieties available at New York, Boston, Norfolk, Jacksonville and Chicago. Each week on Tuesday evening NAA will carry similar broadcasts between 7:45 and 8 p. m.

* * *

Hiram Percy Maxim, president of the American Radio Relay League, has arranged to send an amateur radio operator with the Arctic expedition under Donald B. McMillan, which will sail from Boothbay, Me., about the middle of June. It is expected thus to provide entertainment for the long Arctic nights and enable members of the expedition to keep in touch with their families for the greater part of the distance to the pole.

* * *

An English radio enthusiast who thinks nothing of sitting up until 4 o'clock in the morning to get American broadcasting stations reports receiving the entire program of WGY, the Schenectady, N. Y., station of the General Electric Company on four different evenings. The most remarkable feature was his reception on a single tube or valve—as the English call it—home-made receiving set. He is J. H. Brittain, and lives at Eccles, Lancashire, England.

* * *

Hakon Jorgensen, of Copenhagen, Denmark's delegate to the recent International Police Conference in New York City, proposed the universal adoption of a system under which the fingerprints left by a criminal in a New York case could be indexed, codea and broadcast by wireless to Europe; and if the criminal had ever been caught before his past record could be forwarded to the scene of his newest crime all within a day. This system has been in successful use in Denmark.

* * *

Alfred Swan, a pioneer in the incandescent lamp industry, died recently at Upper Montclair, N. J., in the eighty-eighth year of his age. He was the inventor of the brass base used on incandescent lamps. He started in the lamp industry in England after the death of his brother, Sir Joseph Swan, who contributed to the practical development of the early electric incandescent lamp. In 1886 he came to the United States, where he associated himself with the lamp industry, in which he spent the remainder of his life.

Radio and the Woman

By Crystal D. Tector

THE Schenectady broadcasting station of the General Electric Company, WGY, has been honored by a Wisconsin family. A brand new baby, according to the father, has been named after the Schenectady station. He is Wallace Gordon Yadon and he lives in Delavan, Wisconsin. M. E. Yadon, advertising manager for the Bradley Knitting Company wrote to WGY as follows: "We have a baby called the 'radio boy' because we have named this child after your station, which indicates that not only the child is a favorite but that your station is our favorite. We only hope that you will broadcast twenty-four hours daily. The boy's name is Wallace Gordon Yadon. The receiving set has been placed at the hospital for the past five weeks and even the little fellow is getting so he can recognize the announcer. We are proud of our son and trust that you will welcome what we think is your first namesake."

* * *

My cousin, whom I haven't seen in years, recently took it into her head to come to New York and knowing that we lived in the suburbs decided to come to us. She spoiled my entire day by telling us that her husband's nephew was the owner of a powerful broadcasting station and that she occasionally sang. "It is such a nuisance though, because I really enjoy the applause of my listeners, and I can not hear them when I broadcast." Well, that surely is nice. Most people are satisfied knowing that hundreds of thousands are listening to them, but even at that you can not satisfy everybody and some people are just little piggies for praise. I would simply be delighted could I even talk into "those fearful black discs" without wanting to hear any applause at all.

* * *

Babies now cry for radio. The new national pastime has invaded the nursery and many mothers are adopting radio waves as pacifiers. A mother of six children, the oldest eleven years old, writes WGY, the Schenectady broadcasting station of the General Electric Company that her youngest child, aged fourteen months, is already a fan. Mrs. Robert Barbour of Rensselaer, N. Y., says: "I wonder if it would interest you to know that I think I have the youngest radio listener. My baby is fourteen months old and she walks to the desk where I have my crystal set and points for me to open it. When there is anything she sits with the ear phones just as nice as any large person but as soon as it stops she takes off the phones and starts to scold for more. I have six children and they all like to listen. I have two sets of phones and they separate them."

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DX Nite Owls Records You Can Shoot At

He Calls It a Record—How About It?

From H. S. Fredrickson, 406 Howard Street, Charles City, Ia.

I HAVE what I call a record on the total number of broadcasting stations heard, and also on the largest number heard in one night. To date I have heard one hundred and seventy-nine different broadcasting stations with my set. The number includes stations on both coasts, Canada, all through the United States, and one—"PWX"—from Cuba. As a list of calls would take too much space I will give the number of stations from each state, as follows:

Alabama, 2; Arkansas, 1; California, 7; Colorado, 7; District of Columbia, 1, Georgia, 4; Idaho, 1; Illinois, 11; Indiana, 5; Iowa, 14; Kansas, 5; Kentucky, 2; Louisiana, 3; Massachusetts, 3; Michigan, 5; Minnesota, 9; Missouri, 11; Montana, 2; Nebraska, 6; New Jersey, 2; New York, 9; North Carolina, 1; North Dakota, 2; Ohio, 9; Oklahoma, 7; Pennsylvania, 10; South Dakota, 1; Tennessee, 5; Texas, 13; Utah, 2; Virginia, 1; Washington, 1; Wisconsin, 7; Canada, 9; Cuba, 1.

On Friday, March 9, 1923, during a period of only four hours (7:15 to 11:15), I copied forty different broadcasting stations—all DX boys—as follows:

WOC, Davenport, Ia.; CFCF*, Montreal, Canada; KYW, Chicago, Ill.; CJCG, Winnipeg, Canada; WCAE, Pittsburgh, Pa.; WHB, Kansas City, Mo.; WGY, Schenectady, N. Y.; WOR, Newark, N. J.; WBAA*, Lafayette, Ind.; WDAJ, College Park, Ga.; WDAO, Dallas, Texas; WGAQ, Shreveport, La.; KDYL*, Salt Lake City, Utah; KDKA, Pittsburgh, Pa.; WPAK*, Fargo, N. D.; WIAR, Paducah, Ky.; WJZ, Newark, N. J.; WOS, Jefferson City, Mo.; WHAS, Louisville, Ky.; WFAT, Sioux Falls, S. D.; WMC, Memphis, Tenn.; WDAF, Kansas City, Mo.; CKCK, Regina, Canada; WEAB, Fort Dodge, Ia.; WSY, Birmingham, Ala.; CJNC, Winnipeg, Canada; WAAC, New Orleans, La.; KFAF, Denver, Colo.; WLAG, Minneapolis, Minn.; WGM, Atlanta, Ga.; CFAC, Calgary, Canada; KHJ, Los Angeles, Cal.; WIP, Philadelphia, Pa.; WSB, Atlanta, Ga.; KFDL*, Denver, Colo.; KLS*, San Francisco, Cal.; WBL, Anthony, Kansas; WOAZ, Belvidere, Ill.; KLX*, Oakland, Cal.; WJAM, Cedar Rapids, Ia.

*New stations.

My set is home-made—detector and two stage; ultra-audion circuit. The second stage was added only the night before I received the forty stations, so 172 of the 179 stations were heard on one stage.

From the Lone Star State

From Kent Deckard, Rusk, Texas.

I AM a constant reader of RADIO WORLD and am interested in the DX records so I am going to submit a few of mine. I purchased my set on November 2, 1922, and have received 256 different stations, including about 50 amateur stations. Some of the most distant stations are: CFCN, Calgary, Canada; PWX, Havana, Cuba; 6KW, Tuinuco, Cuba; KDKA, East Pittsburgh, Pa.; KGW, Portland, Oregon; WGY, Schenectady, N. Y.; KHJ, KFI, Los Angeles, Cal. On April 18 between 6 and 1:15 o'clock I received 34 different stations. They are as follows: WEAY, WHB WGAR, KDKA, WKY, WHAS, WBAP, WOC, WCX, KSD, WOS, WGV, WLAG, WSY, WEAH, WLW, KOB, KHJ, WMC, WPAD, WSB, KFFQ, 6KW, WRAL, WDAJ, WQAQ, WDAF, KWH, CFCN, WGM, KFI, 8XAW, 5XAJ.

I have a Tresco set with one stage of radio frequency. I work detector and amplifier on 22½ volt B battery and get better results and louder signals than if I use 45 volts for amplifier and 22½ volts for detector.

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

Just to Make It a Little Harder

From Jerome M. Freedman, 1333 Iranistan Avenue, Bridgeport, Conn. Radio 1-AOE & 1-CCR

I HAVE been reading your column which you have donated to the Nite Owl gang. I have never bothered with making out reports of the stations I have heard unless it was far enough to send a Q. S. L card. But here I make my debut in the RADIO WORLD. The receiver at this station is a Reinartz tuner, and I'll say that this make of set is the rattlesnake's hips for long distance DX. It will be noticed in the hook-up that there is a choke coil in the plate

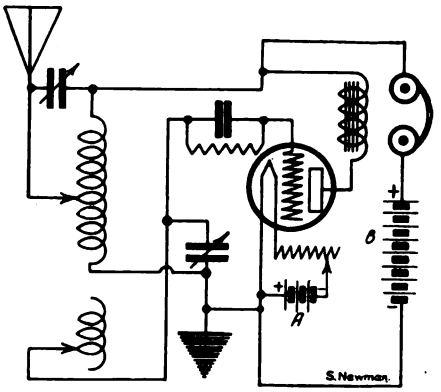

Diagram of improved Reinartz circuit as used by J. M. Freedman. The choke coil in the plate circuit is something radical in receiving circuits.

circuit. This choke is wound with about 75 turns of No. 22 B. & S. wire. Wind the coil in any zig-zag fashion and while it is on the coil tie threads of cotton in places and remove the wire from the coil. Don't be fancy when winding this coil. For audibility the wire that went to the plate switch goes to the stationary plates of the aerial condenser. Sometimes the set did not function or oscillate on 200 meters, so I found, by disconnecting the ground wire, she would then work fine. I used *detector* only to get these: 6-ZZ, Arizona; 6-XAD, St. Catalina Island, Cal.; 6-XJ, California; 6-CC, Colusa, Cal.; 7-GV, Seattle, Wash.; 7-ZU, Montana; 7-ZV, Wyoming; WHAD, WDAF, WMAQ, WEAS, KSD, KDKA, WJZ, WOR, WOS, WBT, WDAL, WDAP, WWJ, WLW (phone and code), WSB, WBAP, WHN, WFAS, WAAM, WBAM, WCAE, WEAF, WHAS, WHAV, WHAZ, CFCA, PWX, WKAQ, WGI, WGY, WGM, KYW. How about it, Eddie? Pretty good? I will answer any cards.

The Pup Drags It In on an Indoor Aerial

From Robert N. King, 77 Mayo Avenue, Needham 92 Mass.

THIS is my list of stations that I have heard. I used the Stockelberg Pup Circuit and U.V.-201-A for detector and C301-A for amplification. I used an indoor aerial: DX—WGY, WRL, WRW, WHAZ, WHAM, WGR, WEAF, WMAC, WHN, WMAK, WJZ, WOR, WIP, WOO, WFI, WNAT, WGL, WDAR, WCAU, WWAD, KDKA, WCAE, WJAS, WHAF, WRAJ, WGAL, WQAA, WLAO, WSAJ, WBAK, KYW, WDAP, WMAQ, WJAZ, WPAD, WJAX, WEAO, WCAH, WLW, WDAK, WAAQ, WEAN, WJAR, WLAK, WWJ, KOP, WHAL, WHAS, WGAM, WSB, WGM, WHAO, WBL, WOC, WFAA, KSD, WMC, WNAV, WLAG, WBAH, NOF, WEAS, PWX, 5-KW, CFCF, CKAC, CHYC, CFCA, CJGC, CFCX, WLK, WOAW, WLAN, WSY, WCAT, KFCV.

Local—WNAC, WFAU, WAAJ, WGI, WQAS, WDAU, WBZ, WCN, WMAF.

Important! Verification Wanted! Who Knows?

From Kenneth M. Jones, 1646 Richmond Avenue, Columbus, Ohio

I HAVE a few new DX records I would like to enter in your DX page. I am using one radio and one audio. The set is a Grebe RORN tuned, radio-frequency, a detector and one stage of audio-frequency.

CHB, Calgary, Canada; KGO, Alameda, Cal.; KNO, San Francisco, Cal.

On the night of March 14, 1923, between the hours of 9:45 and 9:58 p. m., I think I listened to a concert by a Brazilian orchestra and a talk by one of the officials of the Brazilian government (of course, in Spanish or Portuguese) from a station—SPC or SPE—at Rio De Janeiro, Brazil. I wrote for confirmation, but I did not get any reply at all, so I assume that my letter was never received by the right parties. This is not bad on two tubes, as no radio-frequency was being used at the time. The distance is about 5,900 miles air-line.

They Have Owls in Mexico Too

From S. A. Grogan, Apartado, Num. 106, Tampico Tampa, Mexico

I HAVE been reading some of the records of the DX "Nite Owls," and believe that my last night's listening period was worth while. My set consists of three stages of radio-frequency, detector and two steps of audio-frequency, using the ordinary regenerative circuit, rigged for using honeycomb coils, but am using a "Tunit."

WHB, Kansas City, Mo., 1,180 miles; WGY, Schenectady, N. Y., 1,990 miles; WBAP, Fort Worth, Texas, 740 miles; WFAA, Dallas, Texas, 750 miles; WMC, Memphis, Tenn., 1,000 miles; KSD, St. Louis, Mo., 1,220 miles; WSY, Birmingham, Ala., 1,030 miles; WOS, Jefferson City, Mo., 1180 miles; WLAG, Minneapolis, Minn., 1,580 miles; KFI, Los Angeles, Cal., 1,490 miles; WSB, Atlanta, Ga., 1,140 miles; KFDB, San Francisco, Cal., 1,800 miles; WDAF, Kansas City, Mo., 1,180 miles; CFCN, Calgary, Alta., Canada, 2,175 miles Total, 18,455 miles.

If any one should wish to check me up on CFCN, will state that I heard a cabaret program being broadcast between 12 midnight and 1:00 a. m. I tuned them in at 12:15 a. m., Mountain Time, and kept them on until they signed off.

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Teaching the Infant Radio to Walk

By Henry Ferris, Jr.

THE growth of Radio has been bewilderingly swift. Just when Father Business was about to offer it a bottle he found to his amazement that the infant was already in long pants and yelling for roast beef. The result has been confusion in the Radio household.

In this particular discussion we are principally interested in the "kitchen" of the Radio household—that is, those phases of Radio's problems which have to do with *marketing*.

Our object is, by observation and analysis, to point out certain fundamental weaknesses of Radio merchandising as it is now being done, and, by analogy with certain lines of business which have been much longer established, to point a way by which the infant Radio can be fed the same diet without getting indigestion. In fact, the precocious infant has already had its fingers in the jam jar, and therefore it is desirable to find a prescription for the indigestion that has already set in.

Just as a physician seeks *facts* as a basis for his diagnosis, the author went out and visited all the important factors in the trade in order to make a correct diagnosis of the current situation in Radio. These factors included:

1. "Consumers"—i. e., users of Radio apparatus.
2. Jobbers and dealers—i. e., sellers of Radio apparatus.
3. Broadcasters.

The result of this investigation was that certain conditions came definitely to light, and certain conclusions were reached as to the underlying causes of these conditions.

Everybody likes to read the back of the book first, so the causes will be stated first. They are many and diverse, but the principal causes can, by careful analysis, be boiled down to these:

1. The development of broadcasting.
2. The amazing progress of invention.
3. The equally amazing adaptability of the American Radio public.
4. The educational work done by the Radio press and the big daily newspapers.
5. The avid thirst of the American public for up-to-the-second information; its deep desire for all educational and enlightening influences, and its curiously mixed love of good music and passion for "jazz."
6. The fact that all of these benefits are, after a small first investment, available, *at will*, at any hour of the day or night, and absolutely free.
7. The need for a constructive and educational hobby, an outlet for excess energies, a refuge and change for tired brains, a fascinatingly interesting excursion into the mysteries of nature.
8. The tremendous fortunes made over night by youthful inventors.
9. Legal developments relative to "wave bands," restrictions on amateur sending and the classification of broadcasting stations.

With these causes the Radio public is largely familiar. They will not be enlarged upon for the reason that it is with *effects on the trade that we are* chiefly interested.

Broadcasting has increased enormously since April 1, 1922, when 137 broadcasting stations were sending, until now, when there are over 500 licensed stations in operation and, with the exception of one point in the southwestern section of the United States, there is no spot in this broad land of ours that is farther than 150 miles from some broadcasting station. The United States Bureau of Standards is authority for this statement.

Take a population map of the United States and spot these 500 stations and you will see that today *Radio broadcasting is available* to 98 per cent of our people, *territorially*. Financially, also, it has become available to anybody who can spend as little as $15.00 for a simple, home-made set. From a merchandising viewpoint this means that small tradesmen everywhere are beginning to sell Radio apparatus. Cross-road general stores have added Radio to the multitude of things they "carry." Plumbers, tinsmiths, electricians, hardware and toy stores are installing loud-speakers in their windows or doors to draw the crowds—and *it does the trick*.

The points we are getting at are:

First, that the entire American public is becoming "Radio-conscious." The market is enormous and growing daily more complex.

Second, that Radio equipment is being sold in an unfortunately great number of instances by trade factors that are incapable of doing a good job. Ignorance, not only of the basic principles of Radio engineering, but, worse, a still deeper ignorance of the right way to conduct a retail Radio business, is resulting in a very high percentage of failures. These bankruptcies are one fertile source of the worst evil in Radio merchandising—price cutting. Bankrupt stocks sold for a song to "gyp" buyers are re-distributed at less than the cost of manufacture. Result: Manufacturers themselves "go broke" in the effort to sell to the trade against this type of competition, and then *their* inventories flood the market with disastrous results; irresponsible buyers, fly-by-night Radio "stores," unguaranteed, un-trade-marked, imperfect, out-of-date and shop-worn Radio products being sold to a "green" market—it's a true picture and a disheartening one.

What are the remedies? What medicine will cure this indigestion?

First, *education of the public*. This process is going on very rapidly, thanks to an enlightened Radio Press and the broad business knowledge of the big metropolitan daily newspapers.

Second, slowing down of the buying impulse to the point where the faculty of *judgment* rules trade and public alike.

Third, selective selling by manufacturers who will soon see the light and sacrifice immediate sales and immediate profits for the sake of a better knowledge of *just who is selling their goods* and *just how they are being sold*. The penalty for misrepresentation, price cutting or failure to give service to be a refusal to sell these outlets any more supplies. This process is going to hurt. There will be, and indeed now are, many complaints about "The Radio Trust" and the like. Most of it is pure bunk and self-deception. The big factors in the Radio industry want Radio apparatus *intelligently* sold; sold at a profit; sold under guarantees that mean something; sold with exact knowledge of the functions, capabilities and limits of each piece of apparatus; sold under a *true* representation of the result that the public may and *may not* expect from any given expenditure.

Fourth, governmental restriction and even licensing of trade-outlets. It's coming is sure as fate—watch for it.

The more or less trite aphorism, "Experience is a hard school but fools will learn in no other" is applicable to the man who thinks that, just because he has $1,500 and a taste for fooling around with electricity, that he is fully qualified to sell Radio equipment to an even more gullible public.

The public learns *faster* than the dealer. Candid dealers will tell you that their most important merchandising lessons are learned by keeping their ears—and minds—open to the comments, criticisms, complaints and comparisons that drift in every day *across the counter*.

If we were asked to give advice to dealers we might offer this: Never expect *praise* from the public—just look for *familiar faces*. If you don't see them, your house is built on sand. If you *do* see them, *serve* them if it costs a fortune, and they will bring their friends. Then you will be building on rock.

A word of warning: Don't use the mystic power of advertising for purposes of *deception*. The writer knew of a case of a dealer who, during the recent shortage of tubes, thought it would be a clever idea to advertise that he had some. He is still in the hospital, but he is quite definitely *out* of the Radio business, to its everlasting betterment. Cynical "gyps" will curl the lip of scorn at this and call to mind the number of cases where they have misrepresented goods or otherwise trangressed the laws of good merchandising and "gotten away with it." To him we say: "Watch your balance sheet!" Transient trade *never* pays the best in any line of business. You pay out every nickel of profit you make on transient trade in the form of rent. Don't think that your landlord doesn't know how many people daily pass your door—he surely does, and you pay a proportionate rental. No, it's the steady customers that pay profits—and there's only one receipt for getting them and holding them. Here it is:

Treat every customer that comes in the front door as if your sole chance of staying in business depended upon retaining his goodwill.

Carry the *right* merchandise—*standard* goods built by real Radio engineers—not *thrown* together by some ex-amateur.

Know the *whole truth* about everything you sell and *tell it* to your customers.

Try to conduct your store in accordance with good business principles. Study the methods of successful druggists, grocers, hardwaremen—and *adapt* what you learn.

Last and most important—give *service*. We're not going to define it. If you don't know what it means, you don't belong in Radio.

Don't do anything for your own benefit that will hurt Radio as a whole.

We have not meant to sermonize. We started out to paint a picture of conditions as we actually saw them and we have rushed at the job of trying to reform the world with our usual enthusiasm.

But the job is too big for any one man. And the real fact is that the situation will *eventually* work itself out on sound economic lines. The truth needs no defense! Our only excuse for this article, then, is a more or less laudable desire to speed the process. With apologies to one of the really great merchandisers of the world, it might be put: "Eventually better Radio Merchandising—Why not *NOW?*

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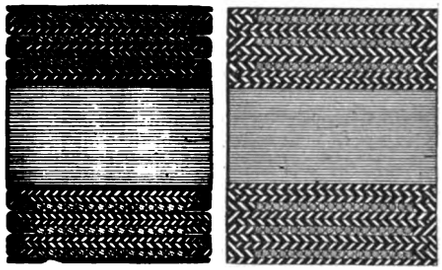
Latest Radio Patents

Method of Winding Electric Coils

No. 1,450,362: Patented April 3, 1923. Patentee: Philip Gilinson, Lowell, Mass.

THE object of the present invention is to overcome difficulties and to provide an electric coil which is much easier to wind, which has the spaces between successive layers of insulation substantially closed, which is much more effectively insulated than are ordinary coils, and which is generally superior. The invention comprises layers of insulation having ends of increased thickness, the ends being of sufficient thickness substantially to close the aforesaid spaces between the layers of insulation at the ends of the coil. This increased thickness is preferably produced by upturning the ends of the layers of insulation before the layers are applied to the coil, and the preferred way of upturning the ends of the layers of insulation is to fold the ends back into parallelism with the layers of insulation respectively. The layers of insulation may be made cylindrical, either circular or with flattened sides, in which case they are slipped on over the ends of the coil. However, the layers of insulation are preferably made o strips or ribbons, in which case a strip of sufficient length to encircle the coil and preferably overlap somewhat is wound upon the coil after each layer of winding has been applied. When making the insulation in the form of strips or ribbons, the edges of the ribbon are folded over before the ribbon is wound on the coil and preferably at the time the ribbon is manufactured. When the ribbon is impregnated with varnish or the like the varnishes cause the folded edges to adhere to the main portion of the ribbon. In the preferred form of the invention the insulation between the winding of the coli is made up of two parts or strips, one part being narrower than the other. The narrow



Sectional views of a coil wound by Gilinson's method.

strip is placed on the wider, the ends of the latter being folded over and upon the former. The strips of insulation may be of the same thickness or of different thicknesses. Such a construction makes a long wearing coil in which the windings are not easily displaced and the danger of sparking between the windings is eliminated.

Apparatus for and Method of Electric Current Control

No. 1,450,749: Patented April 3, 1923. Patentee: George W. Pierce, Cambridge, Mass.

THIS invention relates to an apparatus for and a method of controlling electric currents. The object of the invention is the control of a comparatively strong electric current by means of a comparatively feeble expenditure of energy, and particularly the rapid and reliable control of a periodic current furnished by a comparatively strong local source of electro-motive force by means of comparatively feeble electrical

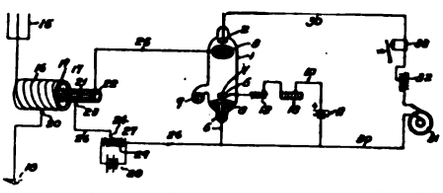


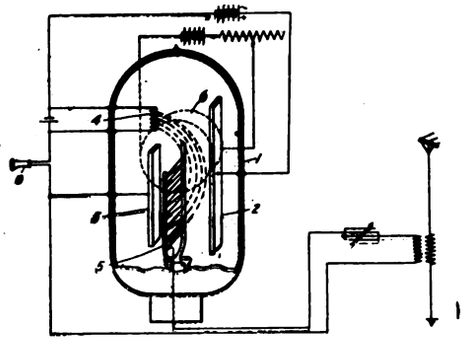
Diagram showing Pierce's method of electric current control.

variations or impulses, or the control of a periodic current by another current or electro-motive force the character of which it is desired to alter. With the above object in view the present invention consists in the apparatus for and method of controlling electric currents hereinafter described and particularly pointed out in the claims. This invention is particularly applicable to apparatus employed for electric signalling in which it is desired to control a comparatively strong local current by means of comparatively feeble signal impulses. The present invention is, however, not limited to signalling apparatus, but may be employed wherever it is desired to effect a sensitive and reliable control of electric current where the energy available for effecting the control is comparatively feeble, or is of a character which it is desirable to transform.

Wireless Amplifier

No. 1,450,275: Patented April 3, 1923. Patentee: Chester T. Allcutt, Pittsburgh, Pa.

THIS invention relates to vacuum apparatus of the type commonly employed for the amplification of impulses in the



Diagrammatic view of Allcutt's wireless amplifier.

transmission of intelligence, having particular reference to that type of apparatus wherein the flow of charged bodies from a hot electrode to a cold electrode is under the control of a grid electrode charged in accordance with the incoming impulses, the charged bodies being permitted to traverse said grid electrode to a greater or less degree, dependent upon the potential thereof. The invention has for its object to provide apparatus of the character designated that shall be simple and reliable in operation and more sensitive than the forms of apparatus commonly employed hitherto for this purpose.

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Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

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The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $280.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Frank J. Kerous, 1823 South Ashland Avenue, Chicago, Ill.
Radio Service, C. H. Affeldt, 496 Provident Avenue, Winnetka, Ill.
Morris Reeser, P. O. Box 2, Bakersfield, Cal.
George C. Green, 401 Dryden Road, Ithaca, N. Y.
John W. Bell, 141 Milk Street, Boston, Mass.
B. M. Horton, 45 Coburn Street, East Lynn, Mass.
R. August, Great Kills, Staten Island, N. Y.
Rev. J. M. Le Guennec, Box C, Chisholm, Me.
F. Renaud, 707 Laval Avenue, Montreal, P. Q., Canada. (Wants to build a one-tube set.)
F. Charles Drew, 83 Walnut Street, Fitchburg, Mass.
R. J. Allen, P. O. Box 825, Yarmouth, Nova Scotia, Canada.
Fred J. Barnes, 18 East Cabarrus Street, Raleigh, N. C.
Erickson & Marken, Watson, Minn. (Retailers.)
J. Mulberg, 207 Duval Street, Key West Fla. (William Cox, manager, radio department.)
Thomas F. Nalepinski, 3124 North Monticello Avenue, Chicago, Ill.
Radio Parts Co., Frederick Willard, Box 56, Dunellen, New Jersey.
Wm. Donaghy, 73 South Bend St., Pawtucket, Rhode Island.
P. J. Larney, 304 Leonard St., Brooklyn, N. Y. (Retailer. Conducts radio department in hardware store and contemplates broadening line.)
M. F. Buziak, 1211 Cedar Ave., Scranton, Pa.
Harry C. Johnson, 61 Broadway, Arlington 74, Mass. (Builds radio sets.)
Almus Pruitt, 147 South Central Ave., Medford, Oregon.
Leo Westcott, Whipple, Arizona. (Retailer and state agent.)
Dr. P. D. MacSween, 32 Sixth St., New Westminster, B. C., Canada.
George E. Morris, Fort Fairfield, Me.
Thomas Moriarty, 220 Pearl Street, Springfield, Mass.
B. E. McCormack, 3018 Enoch Avenue, Zion, Ill.
Harold F. Haggett, 20 Hamlet Place, Malden, Mass.
Music House, B. A. Morris, 109 Spring Street, Newton, N. J.
Morris Goldberg, 251 15th Street, S. E., Washington, D. C. (Is starting retail radio business.)
Eagle Radio & Supply Stores, 49 Smith Street, Brooklyn, N. Y. (retailers and distributors).
Oliver E. Rippel, 269 Sexton Street, Struthers, Ohio.
Atlas Radio Company, 1479 Greene Avenue, Brooklyn, N. Y.
Edgar Bicknell, Box 121, Carl Junction, Mo.
D. B. Shanks, 914 Eleventh Avenue, East, Calgary, Alberta, Canada.
Lawrence Quackenbush, Closter, N. J.
John F. Rofe, 99 Pleasant Street, Cambridge, Mass.
James F. McEvoy, 37 Fourth Street, New Brighton, Staten Island, N. Y.
Richard Edsall, Butler, N. J.
George B. Hostetter, Box 325, Freewater, Ore.
B. Stump, 4980 Tennyson Street, Denver, Colo.
Henry A. Westermeyer, Cleveland, Wis.
G. M. Packard, 4142 Third Avenue, South, Minneapolis, Minn.
Wilson S. Freesland, 77 Walnut Street, Berkley, Norfolk, Va. (distributor and retailer).
Frank T. Walden, Soldiers' Home Hospital, Minneapolis, Minn.
Thomas E. Miller, 729 Woodward Avenue, Nashville, Tenn. (consumer).
H. M. Lawrence, 1610 Washington Avenue, Racine, Wis. (Wants a set or someone to assemble a set for him.)

WJZ Aerial Wrecked by Storm

THE aerial of WJZ, Westinghouse station at Newark, N. J., was carried away by a high wind during a storm on the night of May 7. The operators immediately stretched a temporary antenna but this also was dismantled by the wind. Permanent repairs were made the following day.

Radio Stocks

(Quotations as of May 9, 1923, furnished by Frank T. Stanton & Co., 15 Broad St., New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	15*
American Marconi, Unstamped	$5	$7
American Tel. & Tel.....	122	122½
Canadian Marconi	2	3
De Forest Radio.....	7	10
Dubilier Condenser	9¼	9½
English Marconi com.....	10	15
English Marconi pfd.....	11	16
Federal Tel., Cal.....	4⅞	5½
General Electric	175	176
Hennessy Radio Pub. 8% pfd.	10	12½
Mackay Companies com.....	111	113
Marconi Int. Marine.....	7	9
Manhattan Elec. Supply.....	54	55
Radio Corporation com.....	3½	3⅝
Radio Corporation pfd.....	3½	3⅝
Spanish Marconi	1½	3½
Western Union	110	110½
Westinghouse E. & M.....	55½	56

*Cents per share.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

NATIONAL ELECTRIC LIGHT ASSOCIATION, New York City, June 4-8, 1923; M. H. Aylesworth, executive manager, 29 West Thirty-ninth Street, New York.

PACIFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Cal., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Cal.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, executive committee, The Homestead, Hot Springs, Va., May 21-22. 1923. General meeting, May 23-24, 1923; Franklin Overbagh, secretary, 411 South Clinton Street, Chicago, Ill.

Washington Y. M. C. A. Goes on Air

THE Washington, D. C., Y. M. C. A. has filed an application for a 50 watt Class A station with the Department of Commerce. A feature of the new transmitting set, located in the "Y" building on G Street, is that the plate voltage is derived from a 468 unit storage battery instead of the usual method of employing a direct current generator. This station will broadcast talks on religion, education and physical culture, paying especial attention to matters of interest to boys. The station has been inspected, and it is expected that a license will be issued to the Y. M. C. A. within a few days, assigning a wave length of 283 meters.

It Wasn't a "Mice" Condenser!

THE usually careful proof readers of RADIO WORLD made a slip in reading copy of the Arthur Pudlin Engineering Company's advertisement on page 30 of last week's issue. Reference was made to a "mice" condenser. This, of course, should have read "mica" condenser. The error is regretted.

New Radio and Electric Firms

Edward P. Fogarty Electrical Co., Cincinnati, Ohio; E. P. Fogarty, E. L. Conway, W. D. Murphy, M. M. McClelland and J. J. Geis.

C. B. Cooper Co., 154 Nassau St., New York City, Eastern representatives of Crosley Mfg. Co. and Precision Equipment Co., Cincinnati.

Duntley Radio Corp., Philadelphia, manufacturers; $1,000,000. (Corporation Guarantee and Trust Co.)

Braender Rubber and Tire Co., Wallington, N. J., manufacture rubber products, $265,000; Davis Z. Jeselsohn, Regina E. Donahue, Newark; Benjamin F. Teitelbaum, Jersey City.

Orchestraphone Manufacturing Co., $500,000; T. C. Egettell, J. Ralph Egettell, Lewis E. Harman, Philadelphia. (Capitol Trust Co. of Delaware.)

Bell Telephone Securities Co., Delaware, $1,000,000. (A. A. Marsters, 195 Broadway, New York City.)

The Wireless Press, New York City, has increased its capital stock from $10,000 to $25,000.

Carpenter Automatic Electric Systems Co., Wilmington, Del., build switchboards, $1,000,000. (Delaware Registration Trust Company.)

Borch Radio, Dover, Del., $25,000. (Capital Trust Co.)

Walbat Radio Corp., New York City, supplies and equipment, $5,000; J. R. Batt, W. Stein, S. Goldberg. (Attorney, L. Oppenheimer, 60 Wall St.)

Webster Radio Assembling Plant, 226 Main Street, Webster, Mass. Edward E. Hale, proprietor.

Hawkeye Radio & Supply Co., 505 Eighth Avenue, Des Moines, Ia; wholesale distributors; A. J. Tingley and M. C. Haigh.

The Tomadelli Corporation has changed its name to the Tomadelli Electronic Corporation, New York City.

Allied Dealers' Association, Jersey City, N. J., statistics concerning the standing of business firms, $125,000; William F. Murray, George P. Alzamora, Plainfield; Wilbur S. Norton, New York.

Reco Radio Engineering Co., New Rochelle, N. Y., $10,000; C. E. Munson, J. E. Neumann. (Attorney, J. S. Rustain, New Rochelle.)

Harvard Radio Laboratories Increase Their Facilities

THE Harvard Radio Laboratories, 261 Franklin street, Boston, Mass., announce that they have increased their equipment and facilities for the repair of vacuum tubes and now are in a position to make deliveries in about ten days. They have a strictly up-to-date laboratory and make a positive guarantee that owners of repaired tubes will be perfectly satisfied with the work they turn out. It also is interesting to note that they are making special prices for the summer months.

The Harvard Laboratories request RADIO WORLD to inform its readers that at present they are accepting for repair only five and six watt detector and amplifying tubes using a single tungsten wire filament.

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Directors of Boys' and Girls' Summer Camps

FOLLOWING is a list of names and addresses of directors of boys' and girls' summer camps, each of whom should be a potential purchaser of radio sets for camp and vacation use. Additions to the list will be published in succeeding issues of RADIO WORLD:

Mr. and Mrs. E. W. Sipple, 350 W. Duval St., Germantown, Pa.
Miss Blanche D. Price, 404 W. School Lane, Philadelphia, Pa.
Miss Maude Sanford, Y. W. C. A., Columbia, S. C.
Miss Eliza E. Wardlay, 1214 College St., Columbia, S. C.
Col. L. L. Rice, Lebanon, Tenn.
Mrs. T. F. Taylor, Mont Eagle, Tenn.
Mrs. J. P. Keiser, Osceola, Ark.
T. F. Taylor, M.D., Mont Eagle, Tenn.
Mrs. J. V. Brown, Dean San Marcos (Tex.) Academy.
Mrs. J. V. Brown, Dean San Marcos (Tex.) Academy.
Mrs. Edward L. Gulick, 77 Addington Rd., Brookline, Mass.
Miss Ellen Farnsworth, 77 Addington Rd., Brookline, Mass.
Richard D. Currier, 35 East Park St., Newark, New Jersey.
Miss Ethel J. McCoy, Virginia Interment College, Bristol, Va.
Mrs. Jonathan C. Day, 790 Riverside Drive, New York.
Miss Mary Huston Turk, 610 Lexington Ave., New York.
Dr. Jonathan C. Day, 790 Riverside Drive, New York.
Mrs. Belle A. Roxby, Bat Cover, N. C.
Mrs. Henry N. Carrier, Brevard, N. C.
Henry N. Carrier, Brevard, N. C.
Alex H. Kizer, Brevard, N. C.
Miss Mary L. Gilfillan, Paoli, Pa.
Miss Sarah M. Hart, Glen Ridge, N. J.
Miss Alice W. Hosking, 1608 Chestnut St., Philadelphia.
Wm. Mitchell, 920 Cauldwell Ave., New York.
Harriett M. Mitchell, 920 Cauldwell Ave., New York.
Mrs. Adle Currier, 35 East Park St., Newark, N. J.
Henry F. Ballantine, Redding Ridge, Conn.
James E. Mahan, Redding Ridge, Conn.
Gabriel R. Mason, 2276 Creston Ave., New York.
Harry Sperling, 391 Marlboro Rd., Brooklyn, N. Y.
Andrew I. Albert, 1728 Crotona Park East, New York.
Dana P. Vaughn, Chestnut Hill Academy, Pa.
L. D. Roys, 10 Bowdoin St., Cambridge, Mass.
C. A. Roys, 10 Bowdoin St., Cambridge, Mass.
A. L. Hayden, 10 Bowdoin St., Cambridge, Mass.
J. W. Hayden, 10 Bowdoin St., Cambridge, Mass.
J. Franklin Pineo, Y. M. C. A., Lawrence, Mass.
T. J. B. Fisher, 65 E. 83d St., New York.
Harry L. Hillman, Dartmouth College, Hanover, N. H.
Hubert P. Colton, M.D., Woodberry Forest School, Virginia.
Isaac Price, A.M., 72 E. 96th St., New York.
Dr. Louis Pick, 78 West 119th St., New York.
H. A. Gordon, Tuxedo, N. Y.
Paul Kyle, Irvington, N. Y.
Raymond W. Noon, St. Louis (Mo.) Country Day School.
John E. Noon, 3628 Delmar Blvd., St. Louis, Mo.
Chas. W. Yeager, 2624 Hurlburt Ave., Detroit, Mich.
L. L. Touton, 435 W. 62d St. Ter., Kansas City, Mo.
A. A. Mason, 2545 Valentine Ave., New York.
E. P. Conlon, Concord, N. H.
S. G. Davidson, Tamworth, N. H.
Albert Loewinthan, 227 Audubon Ave., New York.
Samuel Schlosberg, Lathers Pl., New Rochelle, N. Y.
E. A. C. Murphy, 94 Prospect St., New Haven, Conn.
Edward Goldwater, 701 West 177th St., New York.
Gilbert G. Brinckerhoff, 1818 Topping Ave., New York.
Ingo F. Hartmann, 1818 Topping Ave., New York.
John A. Davis, Stevens Inst., Hoboken, N. J.
Max Berg, 949 Broadway, New York.
Ray W. Phillips, 949 Broadway, New York.
A. M. Cowhey, 1061 St. Nicholas Ave., New York.
Mr. Joseph Lowe, 13 Astor Place, New York.
Colba F. Gucker, Lincoln School, 646 Park Ave., New York.
Sidney Krantz, 745 Riverside Drive, New York.
Alice A. Kranz, 745 Riverside Drive, New York.
Col. G. F. Verbeck, Manlius, N. Y.
L. H. Somers, Adirondack-Florida School, Onchiota.
H. A. Swaffield, Montpelier (Vt.) H. S.
Glenn A. Dowling, 10527 Lee Ave., Cleveland, O.
Harold A. Stevens, Box 485 Rye, N. Y.
Dr. Louis Rosenbaum, 545 West 111th St., New York.
Nat. Holman, 371 Grand St., New York.
Dr. I. S. Moses, Straus Bldg., 5th Ave., New York.
Eugene F. Moses, Straus Bldg., 5th Ave., New York.
Robert L. Howard, 190a 3rd St., Jersey City, N. J.
Capt. Lewis Till, Saugerties, N. Y.
Walter C. Crouch, Swarthmore, Pa.
Mrs. E. G. Brown, Glenburnie, N. Y.
Chas. R. Powers, Wilmington, N. C.
Jos. Edw. Eberly, 956 Leggett Ave., New York.
Robert B. Gerstenzang, 956 Leggett Ave., New York.
John F. Molloy, 956 Leggett Ave., New York.
John C. Green, 544 West 157th St., New York.
Julius Ritter, 553 West 141st St., New York.
A. E. Loveland, 251 Maple St., Brooklyn, N. Y.
E. L. Fisher, 24 North Terrace, Maplewood, N. J.
Rev. R. F. Keegan, 480 Lexington Ave., New York.
S. S. Lowenstein, 517 East 9th St., Brooklyn, N.Y.
H. W. Little, Lincoln High School, Jersey City, N. J.
Abraham Greenberg, 719 West 180th St., New York.
Henry Squires, 656 West 171st St., New York.
Frank F. Gray, Central Prim. School, Montclair, N. J.
F. G. Anderson, Scout Headquarters, Montclair, N. J.
C. T. Gordon, Y. M. C. A., Trenton, N. J.
Charles R. Scott, 49 Halsey St., Newark, N. J.
Leslie Deal, Y. M. C. A., Newark, N. J.
G. A. Stokes, Y. M. C. A., Orange, N. J.
Merritt L. Oxenham, Red Bank, N. J.
Max Horowitz, 5000 15th Ave., Brooklyn, N. Y.
H. C. Beckman, 2 West 45th St., New York.
Joseph A. Ruddy, 178 E. 79th St., New York.
A. G. Warren, 38 Birch Crescent, Rochester, N. Y.
Mrs. Leah Gordon, 210 W. 107th St., New York.
Charles Model, 992 Eastern Parkway, Brooklyn, N. Y.
Jacob Theobald, 519 W. 143d St., New York.
Wilfred C. Ackerly, 318 W. 57th St., New York.
Dudley B. Reed, M.D., University of Chicago, Chicago, Ill.
R. B. Mattern, Dobbs Ferry, N. Y.
Eugene I. Smith, Conway, N. H.
A. D. Thayer, Homecrest, Longmeadow, Mass.
Alex Grant, Narberth, Pa.
George W. Orton, 39 S. 10th St., Philadelphia, Pa.
R. A. Watkins, 28 Frye St., Lewiston, Me.
B. A. Hoban, Gilman Country School, Roland Park, Md.
A. B. Sutherland, Plymouth, N. H.
Edward Fast, 555 Edgecombe Ave., New York.
Samuel E. Fast, 555 Edgecombe Ave., New York.
Frederick S. Ernst, 15 Babcock St., Brookline, Mass.
C. Wm. Prettyman, Ph.D., Carlisle, Pa.
E. Leo Barry, 60 Wall St., New York.
Mr. and Mrs. Carroll N. Jones, West Swanzey, N. H.
John C. Bucher, Peekskill, N. Y.
W. E. Richmond, 77 Otis St., Newtonville, Mass.
A. W. Dickinson, 16 Otis Pl., Newtonville, Mass.
Edgar Fauver, M.D., Wesleyan University, Middletown, Conn.
Edwin Fauver, M.D., University of Rochester, Rochester, N. Y.
M. D. Sutherland, Plymouth, N. H.
John B. May, Cohasset, Mass.
Ezra Putnol, 269 E. 194th St., New York.
Morris Klein, 617 W. 141st St., New York.
I. S. Abrahams, 238 E. 8th St., Brooklyn, N. Y.
Prof. Oliver L. Hebbert, 48 Boylston St., Boston, Mass.
David Layton, 669 Dawson St., New York.
Laura B. Garrett, 529 W. 138th St., New York.
Miss Mary L. Jobe, 50 Morningside Drive, New York.
Mr. and Mrs. Harry Davidson, 5333 Rising Sun Ave., Philadelphia, Pa.
J. Wilford Allen, M.D., 117 W. 12th St., New York.
G. D. Robins, The Hill School, Pottstown, Pa.
J. D. Warnock, The Hill School, Pottstown, Pa.
F. Fraser, The Hill School, Pottstown, Pa.
E. C. Durfee, The Hill School Pottstown, Pa.
W. H. Bentley, 14 Beacon St., Boston, Mass.
Miss V. L. Pride, 1242 Elden Ave., Los Angeles, California.
Miss Dorothy I. Bell, San Jose, Cal.
Miss Portia M. Swett, (Summer) . Steamboat Springs, Colo.
Robert B. Brodie, 314 W. 17th St., New York.
Miss Fernecia McCluney, College Industrial Arts, Denton, Tex.
A. A. Jameson, 615 Chamber Com. Bldg., Atlanta, Georgia.
Rev. C. W. Smith, Clayton, Ga.
Miss Sara G. Holiday, Burlington, Iowa.
Albert F. Ewers, St. Louis, Mo.

(To be continued)

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"Regal".....Special, $42.50
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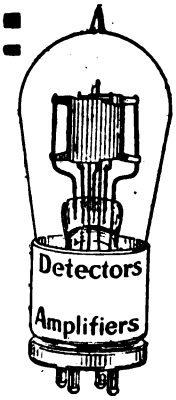

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Personal Printing Co., Box 5255T Boston, Mass.

Reference: International Trust Co., Boston

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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES

One page: One time—$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
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Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Service Officers Form Radio Club

THE United Service Radio Association has been formally organized at the Army and Navy Club in Washington, D. C., by a group of officers from the Army, Navy and other uniformed services of the government. This club has for its objective the education of commissioned officers in the radio art and the fostering of radio development through lectures and experiments.

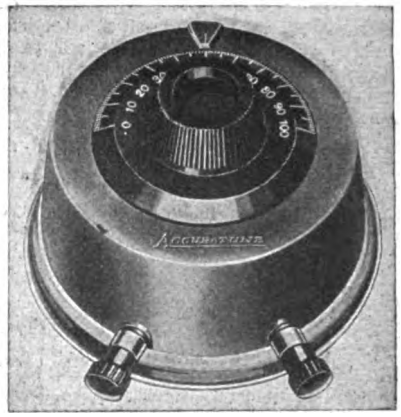
A lecture course by experts on radio was planned following the first practical talk given by Maj. Gen. Geo. O. Squier of the Signal Corps, a member of the association. To date about one hundred officers have joined, including some civilian experts admitted as associate members. At the second session, Capt. J. T. Tompkins spoke on the use of radio in the Navy.

Officers of the association are Lt. Col. F. P. Jackson, Q. M. C., president; Capt. J. T. Tompkins, U. S. N., vice-president, and Capt. R. B. Connor, U. S. A., secretary.

NAA Now Broadcasts on 435 Meters

ARLINGTON NAA will broadcast Governmental information on the 435 meter wave instead of 710. This change was made in connection with the Department of Commerce's new schedule. Talks on the standard radio frequency signals being transmitted by the Bureau of Standards from time to time from WWV, will be an added feature of the Commerce Department's broadcasting schedule from NAA, Tuesday evenings between 7:45 and 8:00 p. m.

AUXILIARY TUNER



Helps Cut Out Those Interfering Stations

Not a mere wave-trap, but a high-grade tuner which when connected in series with antenna will materially improve the selectivity of the average receiver.

One piece molded Condensite Case.
Send Cash or Money Order.

Regular retail list, $7.50. Special Introductory Price... **$5.45** post paid

GUARANTEED TO IMPROVE YOUR SET OR MONEY REFUNDED.

RADIO MULTI-PARTS
897 17th Street Newark, N. J.

SHELTONE
Loud Speaker
With Special
Nath. Baldwin
Type C Headset
Correct in
PRINCIPLE
PERFECT
RESULTS

When you sit back to enjoy the broadcast program you want perfect reproduction.

The band stand in your town, cathedrals, theatre stage, are all built like Sheltone.

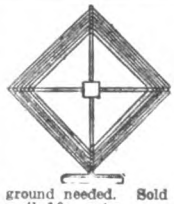
It is built like these to take advantage of the most correct acoustic principles and to reproduce music and speech perfectly.

If your dealer cannot supply you order direct.

Loud Speaker, Complete....$16.00 Postpaid
Loud Speaker, No Phones....$4.00 Postpaid
C. O. D. or Cash with Order.

Dealers, Write for Discounts.

THE SHELTONE CO.
66 HALSEY ST. NEWARK, N. J.



RITTER $1
LOOP AERIAL

A knockdown aerial, including wire; can be assembled in 10 minutes. Endorsed by N. Y. Globe and Mail. Results guaranteed. Ritter loop reduces interference, static and lightning troubles. No outside aerial or ground needed. Sold direct from our factory. By mail 10c. extra.

We also manufacture the now famous RITTER GRAND CRYSTAL SET, price $3.50

RITTER RADIO CO.
230 Canal Street New York City

$25 A DAY *Selling Shirts*

Large shirt manufacturer wants agents to sell complete line of shirts, pajamas, and night shirts direct to wearer. Advertised brand—exclusive patterns—easy to sell. No experience or capital required. Entirely new proposition.

Write for free samples.

Madison Shirt Co., 503 Broadway, N.Y.C.

One Cure for the Re-radiation Evil

EDITOR, RADIO WORLD: The issue of RADIO WORLD for April 28 made mention of a certain apartment house with about a dozen aerials on the roof, all of which led to a regenerative set, save one. The owners of these sets, owing to the unfortunate situation the result of which is objectionable interference, must be somewhat disappointed with radio. Unfortunate this situation may be, yet with the increasing installation of regenerative outfits the situation is bound to become worse, especially in populated districts.

The broadcasting stations are certainly doing all in their power with the expenditure of large sums to perfect their apparatus to improve broadcast programs. To me, therefore, it seems unfair to spoil their efforts at the receiving end. The owner of the set is entitled to clear reception. Then he will boost radio instead of complaining about the squeals from his neighbor's set. In my opinion we must try to help the broadcaster, as he is trying to help us and thus play fair with him, with the other fellow who is "listening in" and with ourselves.

The problem of re-radiation was before me. My outfit gave the neighbors considerable trouble. Likewise in return they gave me trouble. Lately I constructed the Cockaday four-circuit tuner, and now I have no more re-radiating complaints. I am a believer in this circuit. It has volume, it gives truthful reproduction, it is exceedingly selective, and the interference is practically nothing. With two steps of audio I have found the circuit the best I have ever tried.

Any tube set can be easily converted to the Cockaday circuit and the expense would be very small. It might be well to state that WD-11 tubes give excellent results—at least I found it so.

Very truly yours,
L. E. LAMB.
1241 East Seventh St., Brooklyn, N. Y.

Solving an Aerial Problem

EDITOR, RADIO WORLD: In RADIO WORLD for April 28, 1923, there was an article, "An aerial problem to solve." My experience might be of help to many fellow fans not able to have an overhead aerial.

The fire escape proved to me a salvation, with which I received as far as WGY on one tube. My longest distance was Frank Jones, Cuba, on a 75-foot aerial and with a standard regenerative set, variocoupler, two variometers and two stages of audio-frequency. Without aerial, but using the grid variometer binding post as ground connection, I receive all local stations, and WGY, WJZ, WEAF, WOR and other local stations I receive without aerial or ground.

If you publish this I wish to hear from fellow fans who try the grid connection scheme, and I will be glad to answer any questions regarding this.

In addition I wish to express my thanks to your publication as I find it very helpful to amateur radio fans.

686 Third Ave., CHRIST FATSEAS.
New York City.

Broadcasting Announcers, Attention!

EDITOR, RADIO WORLD: In regard to the kind of material for broadcasting, I think that, in fairness to all fans, a mixed program is best.

But, in my opinion, the worst feature of broadcasting is the fault of the announcer who gets his station letters thus: "ABC." The announcer should say: "A—B—C." We hear the program and don't get the stations letters, and consequently don't know who is broadcasting.

A Cool Summer Predicted—Good News for Radio Dealers

Dr. C. G. Abbot, Eminent Heliologer, Says the Sun Won't Be as Hot as Usual This Summer

THERE is one man at least who does not think that the coming summer is to be a hot one. He is Dr. C. G. Abbot. He knows all about the sun, moon, stars and other planets. He announces that the warming qualities of the sun during the months of 1923 already passed have been from 3% to 4% less than in former years.

He predicts that in all likelihood we will have an unusually cool summer and that folks will stay indoors more than ever before during this period.

All of which, of course, is glad news for the radio dealer.

WOC Assigned New Wave Length

In accordance with the provisions made at the radio conference recently held at Washington, Station WOC, Palmer School of Chiropractic, Davenport, Iowa, has been assigned a wave length of 484 meters. The Sunday afternoon concerts from 1:45 to 2:45 will be omitted until the first Sunday in September. All other schedules will be broadcast as usual during the summer.

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A Money-Back Guarantee Goes with Everything We Sell

Standard Parts at Lowest Prices

SPECIAL—$12.00 GENUINE V. T. 2 TUBES..... **$6.50**

	C-301-A	$8.50
	U. V. 199	6.50
	W. D. 11 or 12	6.50
	COCKADAY COIL	2.00
6.50	A. P. Detector Tubes	4.00
12.00	Nathaniel Baldwin Type C double	8.75
	Master Baldwin Type C double	8.25
	Baldwin Type C single	4.00
8.00	Brandes Head Sets	3.75
8.00	Federal Head Sets	4.95
7.50	Stromberg-Carlson Head Sets	5.75
10.00	N & K Head Sets	6.00
7.00	U. V. 712 Audio Transformers	5.75
7.00	Federal Transformers	4.75
5.00	Acme Transformers	2.75
	Rasla Radio Transformers	5.00

Atwater-Kent Apparatus—Full Line in Stock

COMPLETE STOCK—MANY OTHER BARGAINS—WRITE FOR PRICES

Send Money Order or Certified Check and include Postage.

GLOBE RADIO SHOP
115 West 23rd Street New York

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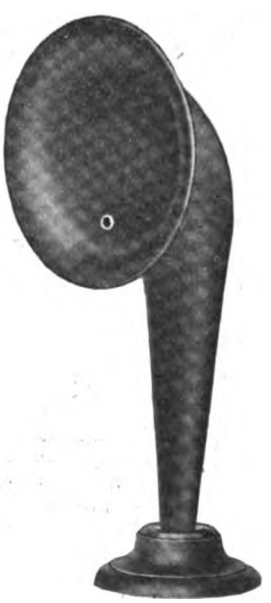

"Granolite"
Made in three sizes.
No. 1 with 7½ inch bell; height, 15 inches.
No. 2 with 9½ inch bell; height, 19 inches.
No. 3 with 14 inch bell; height, 25 inches.

UNIVERSAL LOUD SPEAKER RADIO HORNS

THE ALL-WOOD, PERFECT REPRODUCING HORN YOU HAVE BEEN LOOKING FOR

They will not warp, crack or peel

"GRANOLITE" Universal Radio Horns are positively superior to all others because we have embodied in their construction perfect acoustic qualities, careful workmanship, high grade, carefully selected materials, strength and beauty of design. The base construction and equipment is universal, permitting the installation and use of any of the standard and well known loudspeakers and receivers.

LIST PRICES

No. 1 Horn, 15" high.....$8.00
No. 2 Horn, 19" high.....$10.00
No. 3 Horn, 25" high.....$12.00

Immediate Delivery Prepaid on Receipt of price. Above prices apply to horn and base only. If horn is wanted complete with receiver add $6.00.

Dealers, write for own special trade proposition.

Granolite Horns Are Manufactured Solely by

Granolite Art Products Co.
222-224 4th STREET MILWAUKEE, WIS.

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Please send me RADIO WORLD for ..... months, for which please find enclosed $.....

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Replaces aerials, loops, electric light plugs, etc. Eliminates lightning dangers. Reduces STATIC and other interference. Brings clearer signals and truer tone. Works on all standard vacuum tube sets.

Postpaid, Anywhere, for $5.00

Satisfaction Guaranteed, or Money Refunded.

Dealers: Write for our proposition.

Short Cut Radio Corp.
243 West 54th St. New York

Radio Opportunity

High grade retail store, 42nd Street, Grand Central zone, will consider subletting space to Radio Expert (Capital $15,000) or will consider commission basis. Address our advertising agents,

LEWIS ADVT. CORP.
220 Broadway

THE ANNIVERSARY NUMBER of Radio World was increased in size and is an exceptional issue. A few copies left at 15c. each, or you may start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

WHAZ to Change Wave and Hours

BEGINNING with its weekly Monday evening program May 21, radiophone station WHAZ at Rensselaer Polytechnic Institute, Troy, N. Y., will broadcast on a 380-meter wave length as assigned by the United States Department of Commerce. At present this Class B station is broadcasting on a 400 meter wave. Coincident with the change in wave length, station WHAZ will change the hour of starting its broadcast programs Monday evenings from 8.15 to 9 o'clock, Eastern Standard Time (10 o'clock, daylight saving time), in order that its programs may be broadcast without interference and completed without interruption. Heretofore this station has been restricted to the period between 8:15 and 9:30 p. m. and frequently its programs have had to be curtailed. This change to a later hour will also meet the approval of the many listeners to WHAZ programs in the Middle and Far West and Western Canada.

Features of the Program from WGY

Miss Ethel Newcomb, nationally known concert pianist and probably the best known radio pianist, will be featured on the Monday evening program of WGY, the General Electric Company station at Schenectady, N. Y., May 21. On the same program will appear William Demorest, boy soprano, and Edward Rice, violinist.

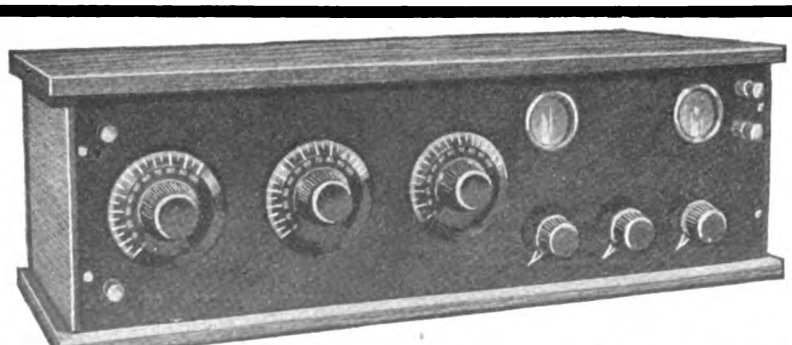
As a result of a great many requests for another evening by the Georgia Minstrel Boys, the studio manager has prepared an entirely new program for these entertainers for Tuesday night, May 22.

Wednesday night is "silent night" for WGY. Thursday evening, May 24, the WGY Players will produce the rollicking Broadhurst farce, "What Happened to Jones."

Major Edgar C. Leonard will deliver an address Friday night, May 25, on "The Citizens' Military Training Camp."

Special Licenses for Broadcasting Development

IN an effort to encourage the scientific development of broadcasting and apparatus for that purpose, the Department of Commerce has created a new form of special license known as the "Broadcasting Development Class." Licenses in this class will be issued to station owners having transmitting and receiving sets of their own design and manufacture, provided in duplicate where failure is likely to occur. These stations are to be used for the improvement of broadcasting and many special requirements are demanded by the Department. Detailed information will be given on application.



SPENCER SUPERIOR RECEIVER—PRICE $69.50

INCORPORATING THE NEW SPENCER "EQUIDYNE" CIRCUIT.

The greatest of all radio frequency circuits, combining good selectivity, long range and wonderful volume without distortion, and with less static.

A four tube set that is a masterpiece in design and workmanship, setting a new standard for beauty and efficiency. Absolutely guaranteed.

Free literature upon request. Liberal proposition for dealers and jobbers.

SPENCER MFG. CO., AURORA, NEBR.

COMING SOON—Spencer Variable Condensers, Variable Grid Leaks, Rheostats and Potentiometers.

Some Especially Good Back Numbers of Radio World

DECEMBER 23, 1922

Bank Wound Coils and How to Wind Them, by R. L. Dougherty.

A Simple Inexpensive Receiver, by C. White.

Some New Applications for Your Power Amplifier, by F. W. Proctor.

New and Simple Hook-Up Keeps Table Clear, by A. Hennesly and J. Kent.

New Non-Oscillating Detector, by H. P. Donle.

Some New DX Hook-Ups, by Contributors.

DECEMBER 30, 1922

How to Make a Single Bladed Vernier Condenser, by Ortherus Gordon.

Prize Set Built on Kitchen Table, by John Kent.

Construction of a 1½-Volt Dry Cell, by R. L. Dougherty.

Peanut Tubes and Hook-Ups I Have Used Successfully, by P. F. Metzler.

JANUARY 6, 1923

How to Make a Variable Grid Leak, by Ortherus Gordon.

A New Game for Radio Listeners, by A. G. Shirt.

Get Radio Goods That Stand the Test, by C. White.

A New and Unusual Single Circuit for Radioists, by C. White.

American Radio Exposition Gay with Radio Surprises.

JANUARY 13, 1923

Constructing a Simple Reflex Amplifier, by F. J. Rumford.

Some Notes for the Radio Amateur with Little Money, by C. White.

The Set That Works Without an Operator, by R. L. Dougherty.

A Panel Layout for a Regenerative Receiver, by C. Meyers.

Chief Characteristics of the New WD-11, by John Kent.

JANUARY 20, 1923

DX Work with a WD-11, a constructive article with all diagrams and a full page, full sized panel layout, by Ortherus Gordon.

How Radio Is Handled in Uncle Sam's Navy, by R. A. Bachman, U. S. N.

A Reflex Circuit with Crystal Detection, by C. White.

Some New DX Hook-Ups to Try Out, by readers of RADIO WORLD.

JANUARY 27, 1923

Single Circuit Regenerative Receivers, by C. White.

A Two Tube DX Set, for DX Nite Owls to Try, by John Kent.

The Rejector or Filter Circuit, by F. J. Rumford.

The Art of Proper Tuning, by K. M. Swezey.

The New Monster Radio Towers on the Roof of a New York Skyscraper, by R. L. Dougherty.

FEBRUARY 3, 1923

Radio Golf at 3,576 Miles Per Hour, by A. S. Gordon.

Wired Wireless to Insure Secrecy in Radio.

Various Filament Resistances and How to Make Them, by Marius Thouvais.

A New Amplifying Receiving Set Employing Satterlee's Circuit, by F. J. Rumford.

FEBRUARY 10, 1923

A New and Novel Spider Web Tuner, by A. S. Gordon.

Design of an Inexpensive Wavemeter, by C. White.

Hearing WGY in London on a Two-Foot Loop, by our London Correspondent.

Some Dope on the Reclamation of Dry Cells, by Arthur S. Gordon.

Using Two Generators for Supplying One Airplane Set, by S. R. Winters.

FEBRUARY 17, 1923

An Inexpensive Reflex Receiver Utilizing One Dry Cell Tube, by C. White.

The Farthest North Broadcasting Station, by J. L. Wilkie.

Radio Frequency vs. Audio Frequency, by M. C. Batsel.

A Hook-Up That's a Wonder for DX and Long Waves, by G. W. May.

WJZ Heard from Coast to Coast, by John Kent.

FEBRUARY 24, 1923

Fundamentals of Reflex Circuits and Three Hook-Ups, by W. S. Thompson.

Micro Variometer for Sharp Tuning, by J. E. Anderson.

The Flewelling Circuit, by R. L. Dougherty.

Mounting Crystal Detectors on a Panel, by T. W. Benson.

Building a Power Amplifier at Home, by C. White.

MARCH 3, 1923

Multi-Tube Reflex Circuits, by W. S. Thompson.

Perfect Broadcasting Now Possible Through the New Glow Discharge Transmitter, by P. A. Sensenig.

How I Received the American Amateur Signals in France, by Marius Thouvais.

A Simple and Improved WD-11 Receiver, by C. White.

An Efficient Single Tube Super-Regenerator, by F. J. Rumford.

Any single copy of RADIO WORLD mailed postpaid on receipt of 15 cents. Any seven issues for $1.00. All the above 11 issues for $1.50.

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The latest and most essential part of an efficient tube set

***Variable Resistance Leaks for* PANEL MOUNTING**

Mounted on any panel in a few seconds—2 screws serving as connections behind panel.

Get stations you never heard before

No pencil markings—assure unbroken range of 180 degrees. Clarify signals—eliminate hissing.

Complete with either .00025 or .0005 mfd. Micon Condenser..... $1.00

Without Condenser 75c

At your dealers—otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
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For Immediate Delivery

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Berwick Supreme—
3000 Ohms.. List, $6.50 Our Price, $4.25

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2200 Ohms.. List, $8.00 Our Price, $6.25
(Loud Speaker Phones, better than Baldwins)

Lowest prices on all radio parts!
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MOGUL ELECTRIC CO.
236 Fulton St. New York City

Subscribe for RADIO WORLD, $6.00 a year, $3.00 six months, $1.50 three months.

Thinks Radio Broadcasters Should Collect Royalties

A VALUED correspondent of RADIO WORLD imparts the following interesting information anent the royalty dispute between composers and broadcasters:

"I have just read your article on 'The Broadcasters - Composers - Producers Muddle' in RADIO WORLD for May 5. As the radio department of which I have charge in ———'s store is located right next to the phonograph department and also as the two departments have much in common, it has been very noticeable recently that a great many more calls for the old time records and songs have been made than for a long time. The saleswoman at the counter spoke to me about it and it occurred to me that this new demand might be the result of the fact that a local broadcasting station has been using lately nothing but old time melodies.

"If this is the case, it shows that radio has taken a decided grip on the advertising end of music. Personally, I believe this is so. I cannot understand why any fee should be paid to the composers—it should be vice versa."

State Control of Radio in Denmark Proposed

STATE control of radio telephony in Denmark is provided in a bill recently introduced in the Danish Rigsdag by the Minister of Traffic, Assistant Trade Commissioner H. Sorenson reports. It is proposed that the Minister of Public Works shall be authorized to grant concessions for installation of radio receiving sets and that the provisions of the law of April 19, 1907, concerning wireless telegraphy, shall also apply to wireless telephony. It is said that on account of the restricted wave band that will be assigned to Denmark under agreement with the Norwegian and Swedish Telegraph Services the Danish Government will exercise full control over transmitting stations.

British Radio Codes Stolen

Seven secret wireless code books have mysteriously disappeared from the British War Office. A flying squadron of secret service men has been sent into the foreign districts in an effort to apprehend the thieves. Meantime an entirely new official code is being drawn up.

A Five Year Guarantee

ARTHUR PUDLIN'S VARIABLE HIGH RESISTANCE LEAK

Eliminate the hissing and all disagreeable noises and enables you to hear all stations within 3000 miles.

We will at any time within a period of 5 years replace free of charge any A.P.V.H.R.L. that does not work satisfactorily.

COMPLETE WITH BASE

Price with .00025 Mica Condenser, $1.00

Price without Condenser..... 75c.

If your neighborhood dealer does not carry them, send purchase price and dealer's name to

Arthur Pudlin Engineering Co.
Dept. "D" 1540 Broadway, New York
We also Manufacture
The Artmica Condenser
In all capacities 25c.

Same Volume as More Expensive Tubes

THE DELTA

A 3-volt dry cell tube, using a 22½-volt B Battery.
Can be used as a detector in any successful circuit.

$2.50 Each

Composition Delta Socket, 40c each.
Standard Socket Adaptor, 75c each.

DELTA MIDGET TUBE CO.
241 Market St. Newark, N. J.

Send 10c for a copy of the FADA Handbook—a real aid to your experimental work.

F. A. D. ANDREA, INC.
1581-W Jerome Ave., New York City

TO GET THAT DISTANT STATION

USE A COAST COUPLER

This coupler is designed along strictly scientific lines, and is the result of eighteen months' experiment. Wound with green silk covered wire on Bakelite tubing. Very selective.

Following are a few of the many DX stations received with this coupler, and detector tube only, at Long Beach, California:

PWX, Havana, Cuba
WWJ, Detroit, Mich.
WSB, Atlanta, Ga.
WDAP, Chicago, Ill.
CFCN, Calgary, Can.
WBAP, Ft. Worth, Texas

Our adaptation of a popular hook-up furnished with coupler. Coupler fully guaranteed when hooked up according to instructions.

Coupler and diagram, sold only under our money back guarantee. Mailed anywhere in the United States upon receipt of $5.00. Post Office or Express money order.

Make All Remittances Payable to

COAST COUPLER COMPANY

221 WEST SEVENTH ST. LONG BEACH, CALIFORNIA

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

Reinhold Radio Detector. A CHEMICAL DETECTOR. Every spot equally sensitive. Lasts indefinitely. Permanent graphite contact. Ideal for reflex circuits. $1.50 prepaid. WARREN-DARCY RADIO COMPANY, 1441 Broadway, N. Y.

VACUUM TUBE RESULTS FROM A CRYSTAL SET! A "PT" Ultra-Sensitive Contact will increase the range and audibility of your crystal set. We guarantee this wonderful Contact to be MORE SENSITIVE THAN ANY OTHER CAT-WHISKER MADE; and that IT WILL NOT JAR OUT. WITH A "PT" MYRLE WOOD HEARD 46 PHONE STATIONS, IN A THOUSAND-MILE RADIUS! Others likewise testify that the "PT" has given results equaling tube equipment. Simple to install in any crystal detector. Price only twenty-five cents coin. "PT" CRYSTAL CONTACT COMPANY, Box 1641, BOSTON.

A WONDERFUL CRYSTAL SET. Can hear all over Philadelphia, and sometimes outside of Philadelphia. Price with phones, $12.00; without phones, $6.00. Receiving sets, $35 to $200. Guaranteed or money back. Send Money Order or call. Williams Radio, 2339 N. 8th St., Philadelphia, Pa.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

BECOME A MILLIONAIRE over night! I'll send you one million Russian roubles for $2.00. 500,000 for $1.50; 100,000 for 50c. American Sales Co., Box 1278, San Francisco.

MOVIE FILMS—For Professional and Toy Machines. Wonderful complete stories with best Movie Stars. SPECIAL BARGAIN—1,000-foot reels, ONLY $3.00. Stock up, BOYS, while they last. Monarch Theatre Supply Co., 724 South Wabash Avenue, Dept. 69, Chicago.

ARE YOU IN THE RADIO BUSINESS? If so, drop us a card for price list. If not, let us start you in a good paying business. We furnish everything and have a proposition that meets the needs of 90% of the public. Liberal discounts to agents. Immediate delivery. Write today. THE WILKENDA COMPANY, 500 Fifth Avenue, New York.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

IMPROVE YOUR SET by shielding your panel. Experts recommend it. Two square feet sent postpaid for two dimes. RADIO IMPROVEMENT & SALES CO., Room 402, 1658 Broadway, New York City.

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Instruction By Radio from a Central "Professor's College"

THE class that ran by itself" is the new name of the class in international law at Princeton, says the New York *Times*. A tardy professor gave it the opportunity, and the campus has given it the name. A few days ago the senior class in this course assembled at the regular time and place but found no instructor. After waiting the customary five minutes one member suggested the ordinary proceeding of departing. He was voted down, and the class decided to conduct its exercises itself.

When the professor arrived he found things progressing so smoothly that he dropped down into a back seat and "listened in" for the remainder of the hour. The class has "run itself" twice since the accidental inauguration of the system.

This incident is heralded on the Princeton campus as the forerunner of Princeton's system of "self-education," which starts next Fall with the two upper classes.

In commenting on it, Professor Philip Marshall Brown said: "If this custom spreads, colleges will become non-professorial institutions. Then we would probably see a centrally located 'professors' college' where lectures by the country's best authorities would be sent out by radio and questions proposed and answered by wireless telephone. This would also wipe out the always pressing problem of teachers' salaries."

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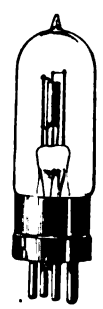
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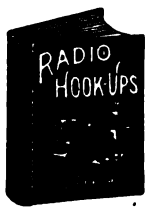

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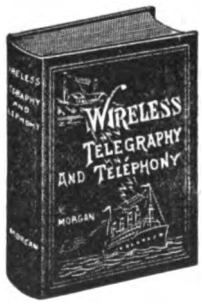

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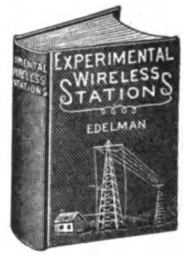

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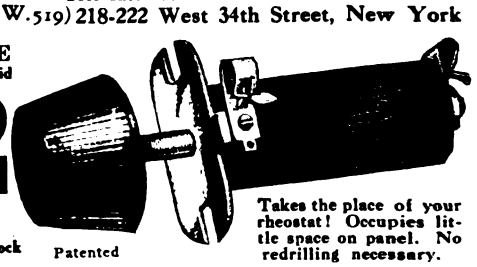

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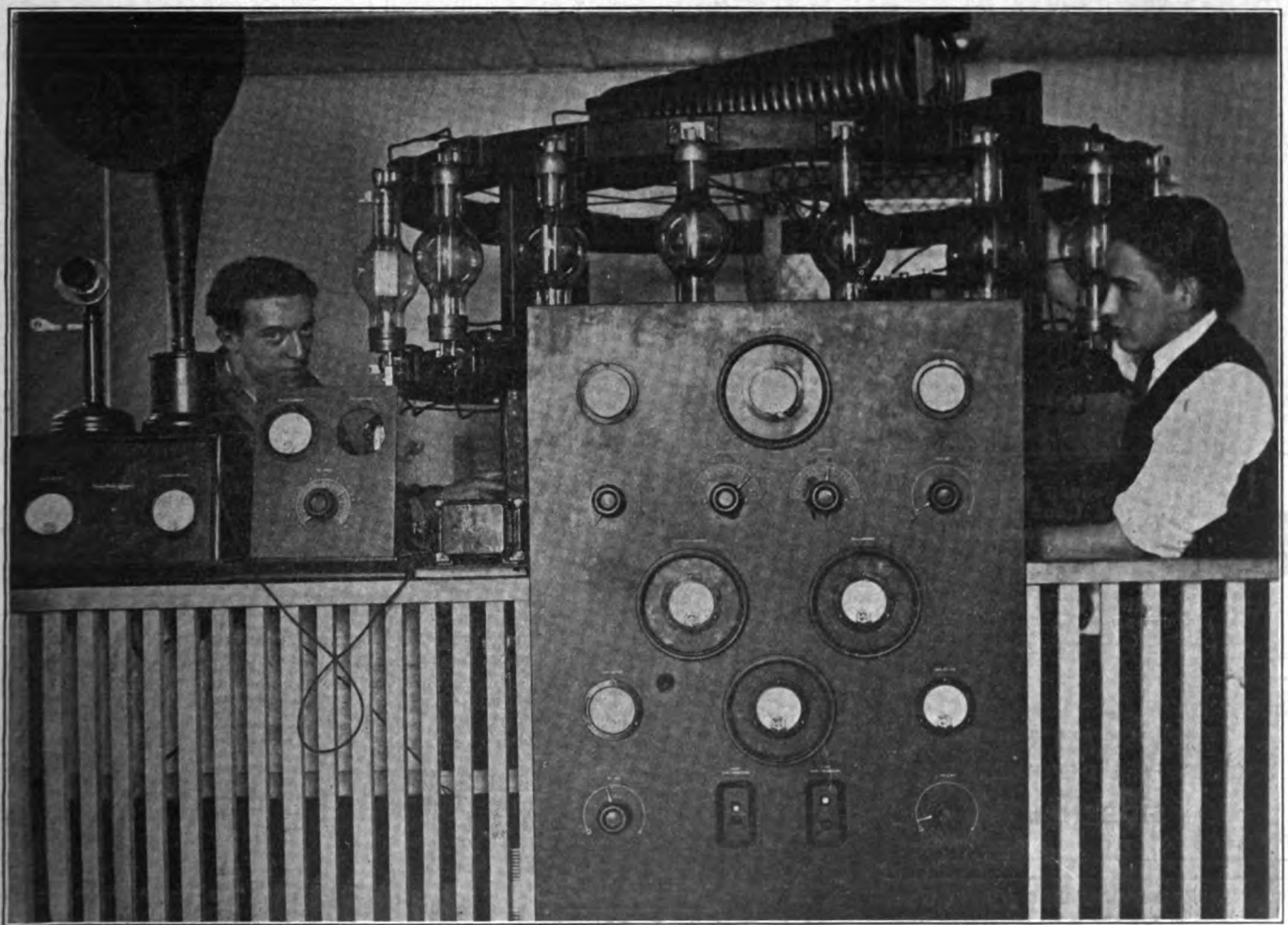

(C. Underwood & Underwood.)

Here is pictured the great transmitter installed in the Edgewater Beach Hotel, Chicago. It has a radius of 3,000 miles. The aerial is 130 feet high and is made of gold-plated copper wire. The studio, on the ground floor of the hotel, is walled with plate glass so that the public may see how broadcasting is done.

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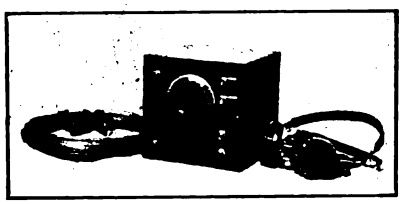
The Radio (Trade Mark) Flivver



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600 } **Motor Operation**

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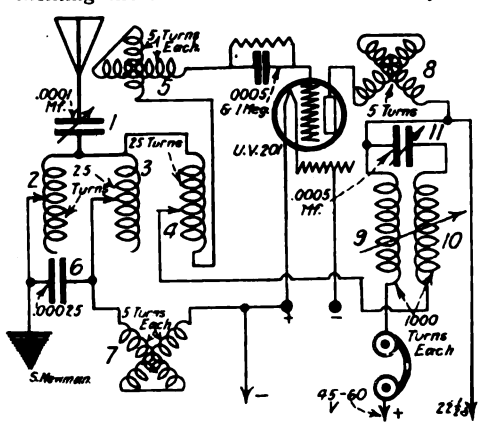
THE ANNIVERSARY NUMBER of Radio World was increased in size and is an exceptional issue. A few copies left at 15c. each, or you may start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

Here's One for You to Try Out—2,000 Miles on One Tube

From Leslie Libby, Vilanhaven, Maine Box 407.

AS a reader of your valuable little paper, and also as an ardent Ham, I feel that a little data on a receiver that has given me good results will help out my brother fans, as well as given them something to "Shoot at some records" with.

The hook-up below gives the idea of the set and I have found that the set works both when on my panel, and when I have the parts laying around on the table, experimenting most folks call it. I call it "just



Kind of complicated to tune—but think of the DX after it is hitting on all six?

foolin'." I have worked all the powerful stations up to 2,000 miles with one U. V. 200 tube with about 60 volts on the plate.

I have carefully marked all the parts so that there wouldn't be any mistake made. The three coils in the primary circuit are all wound on a 3-inch tube, and I have arranged them on a board all about 1½ or two inches apart. The two 1,000 turn coils are honeycombs with the coupling variable. The coupling is fixed between the other three coils. The variometer in the grid circuit is not absolutely necessary but both the variometers in the plate and filament coupling circuit are.

I will be glad to help anyone that constructs this set, and will soon send in a complete list of all the calls that I have heard. Up to the present time I have been so busy copying them that I have not had time to try to list them.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

NATIONAL ELECTRIC LIGHT ASSOCIATION, New York City, June 4-8, 1923; M. H. Aylesworth, executive manager, 29 West Thirty-ninth Street, New York.

PACIFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Cal., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Cal.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, executive committee, The Homestead, Hot Springs, Va., May 21-22, 1923. General meeting, May 23-24, 1923: Franklin Overbagh, secretary, 411 South Clinton Street, Chicago, Ill.

He's Taken It Up, Anyway

"Has he taken up radio as a fad?"

"No, as a frenzy."—*Boston Transcript.*

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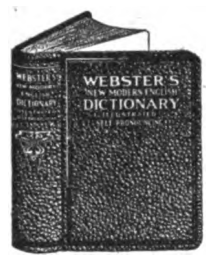

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THE COLUMBIA PRINT

1493 Broadway New York City

HOOK-UP AND CIRCUIT HOUNDS

Did you miss it? Do you want it? If you do, you can get it by writing in to Radio World for any one of these back numbers, as per dates:

Reinartz circuit for 2 tubes	Jan. 13
Good 2 tube WD-11 Circuit for DX	Jan. 27
Satterlee Circuit	Feb. 3
G. W. May's Wonder Circuit	Feb. 17
Power Amplifier Circuit	Feb. 24
Reflex Circuits	Feb. 24
Flewelling Super Circuit	Feb. 24
Multi-tube Reflex Circuits	March 3
One tube Superregenerative	March 3
Lewis Three Tube Circuit	March 10
Regenerative Radio Frequency circuit for 5 tubes	March 24
Hazeltine Neutrodyne Receiver	March 31
2VK'S Transmitter circuit	April 21
Compact Universal Receiver	April 28
Stockelbu:g Pup receiver	May 5
Cockaday receiver	May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Reinartz	May 19

Any number for 15c. Any 7 numbers for $1.00. All 14 numbers for $2.00. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

Sent P. P., prepaid, on receipt of price, by

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RADIO WORLD'S VACATION NUMBER

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OUT NEXT WEEK

VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 9. Whole No. 61 **May 26, 1923** **15c. per copy, $6.00 a year**

How the Modern High Power Vacuum Tube Is Made

By W. S. Thompson, E.E.

BEFORE the development of the high power tube, large transmitting stations where vacuum tubes were used to generate the high frequency oscillations were forced to connect the lower power tubes in parallel to take care of the large amount of power necessary to get a large antenna radiation. This method was not very satisfactory because vacuum tubes, when connected in parallel, generate not only the high frequency oscillations which are needed, but also generate so-called inter-tube oscillations. That is, there are present in the circuits between the tubes very high frequency oscillations which are detrimental to the efficient functioning of the set. These inter-tube oscillations became such a menace when a great many tubes were used that it was almost impossible to get

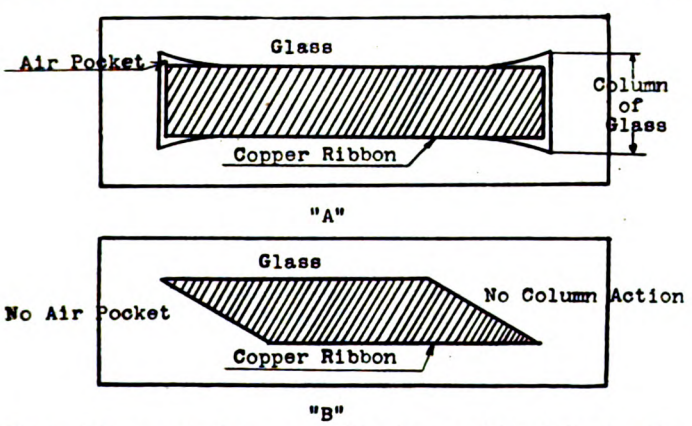
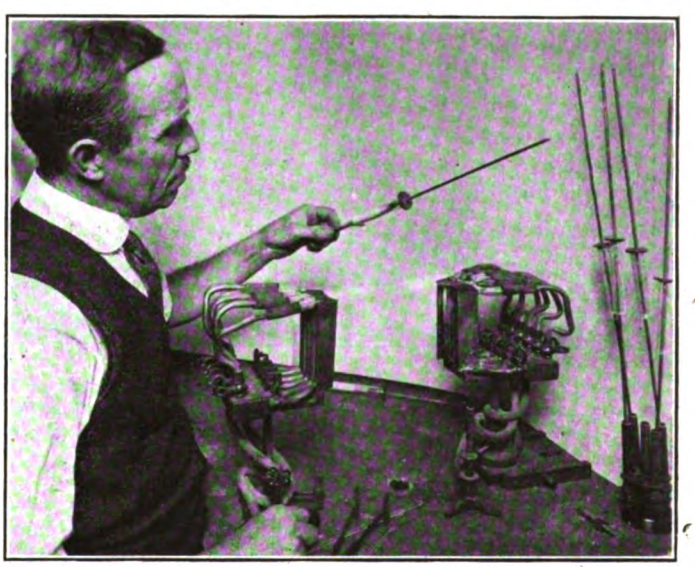


Fig. 1. Diagrams showing unsuccessful and successful methods of sealing a copper ribbon in glass.

a set to operate efficiently. The natural answer to this problem was to build vacuum tubes which would handle a large amount of power so that only a few tubes would be necessary for the largest of stations.

The limiting factor in the manufacture of large tubes has been the problem of dissipating the heat generated inside the tube. The plate in the triode tube must remain cold or at least must be prevented from getting hot in order that the tube function properly, because a hot plate will emit gas which would prevent the tube from operating. The plate therefore, must dissipate sufficient heat so that it does not get hot enough to emit gas. The bright, shiny nickel plate that is usually seen in a vacuum tube will radiate only two watts per square inch of plate surface so this type of plate was discarded as impossible for a large tube.

The next attempt was to blacken the surface of the plate, for a black surface, such as lamp-black will radiate as much as thirty times the amount of heat that can be radiated by polished silver. Plates were made using a blackened plate which would radiate about nine watts per square inch of surface. To make use of this type of plate, the plate surface had to be so great that it was impracticable for very large tubes. The largest tube of this type radiated two hundred and fifty watts from its plate. The solution found for the problem of heat radiation was the water cooled tube, where



(C. Western Electric Co.)

Fig. 2. Assembling a copper disk seal to be used in a high-power vacuum tube.

the plate forms part of the outside of the tube and can be cooled by water circulation. By this method as much as fourteen hundred watts per square inch can be dissipated.

The greatest difficulty to overcome in the development of a water cooled tube was the problem of sealing the glass part of the tube to the metal part. The lower part of the tube is a copper cylinder which serves as the plate or anode of the tube. The filament and grid are mounted inside this copper cylinder and are supported by the glass upper part. A copper-glass seal must be made between the plate and the glass and also between the filament and the grid leads in the upper part of the tube.

Up to the present time platinum has been considered

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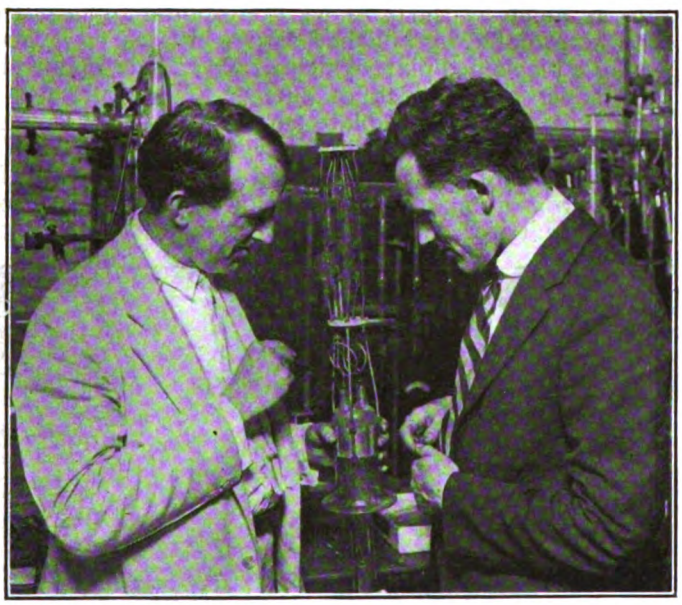
the only metal which can be sealed in glass. The explanation offered has been that platinum and glass, having nearly the same coefficient of expansion, did not separate upon cooling. For this reason platinum has been used for a great many years whenever a metal had to be sealed into a glass tube of any kind such as for the modern incandescent light and the vacuum tube. In the Bell System laboratories of the Western Electric Company a great deal of experimenting was carried on, trying to develop a means of sealing base metals to glass, the high cost of platinum making it impracticable to use this metal in large quantities. The starting point was the discovery of W. G. Housekeeper, of those laboratories that a piece of copper wire if flattened in one spot by a hammer blow would seal very well in glass using borax as a flux. The flat part of the wire sealed well, but the round part in contracting during cooling pulled away from the glass. This led to experimenting with copper ribbon and it was discovered that the seal was perfect with any width of ribbon as long as the edges of the ribbon were sharpened. The next step was sealing without the use of borax or any flux and it was found that a flux was not necessary.

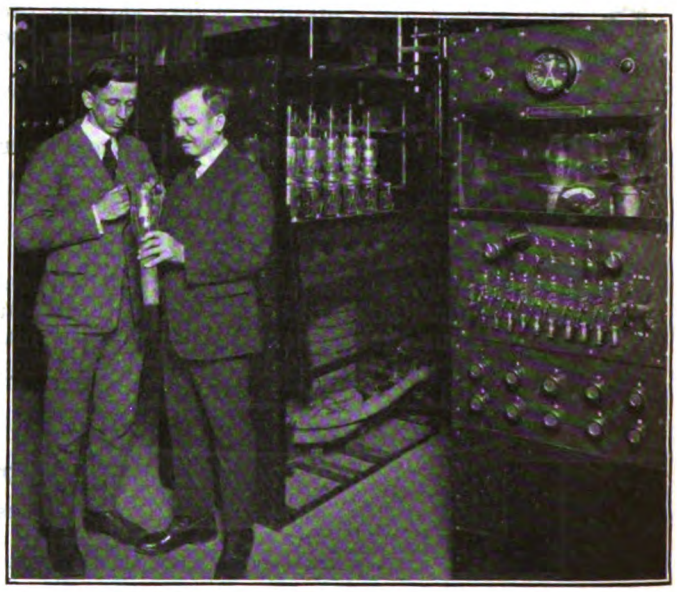


(C. Western Electric Co.)

Fig. 3. W. G. Housekeeper (left) and Dr. W. Wilson (right), of Bell System Laboratories, examining the filament—grid assembly of a 100,000 watt water-cooled tube. Mr. Housekeeper is pointing to a copper disc seal which he developed.

Experiments with copper ribbon lead to the belief that it was a column action of the glass that caused seals with thick ribbon to fail. This is shown in Fig. 1 where "A" represents the way the seal will fail if the ribbon is too thick and "B" represents the shape of the edge to avoid the column action of the glass. All the experiments seem to show that if the seals were so made as to avoid column action and if the copper were thin enough the seal would be perfect. The explanation of why the seal holds is that if the glass wets the copper it will hold it so that it cannot contract enough to pull away from the glass. The author has seen a piece of glass sealed on each side of a copper penny, the glass holding the penny so that it could not contract radially but contracted axially. A seal similar to this is made use of in the assembling of the power tube where the lead-in wires for the grid and filament enter the tube. A thin copper disk is soldered to lead-in wire and this copper disc is sealed to the end of a glass, glass being applied to both faces of the copper disc.

The other important seal, that between the copper anode and the glass tube is made by sealing the glass to the upper edge of the cylinder, having made this edge very thin so that the glass will keep the copper from contracting. The copper part of all these seals is really kept under tension by the glass, the only contracting of the copper being along an axis which will not affect the seal. The glass used in manufacturing these tubes is lead glass but from experiments which have been carried on, it has been concluded that any kind of glass can be sealed to any kind of metal providing the metal is thin enough so the glass will be able to hold it under tension. In making the seals the copper is first cleaned and given an evacuating treatment in a vacuum oven where the temperature is kept at about nine hundred degrees Centigrade. This oven is evacuated and the heating process drives all the air out of the copper saving considerable time in pumping out the completed tube. The copper and glass are then heated to a temperature very nearly as high as the melting point of copper. The glass is firmly pressed against the copper, care being taken to prevent the formation of air bubbles between the copper and the glass.



(C. Western Electric Co.)

Fig. 4. J. C. Schelleng and A. A. Oswald, Bell System engineers, examining a 10,000 watt tube of the type used for trans-Atlantic telephone experiments. Behind them are two groups of ten tubes each which furnish the power for the experiments.

In constructing the grid molybdenum is used for the grid wires and for the supporting structure. It has been found that if the grid wires were welded to their supports, the joints would be brittle, so all these joints are mechanically made by tying the wires together. The grid lead passes the filament lead in the evacuated part of the tube because it has been found that otherwise a corona discharge would be formed.

The pump used to evacuate these tubes will bring the air content down to a pressure of one hundred thousandth of a millimeter of mercury, which means that for every seventy-six million parts of vacuum there will be one part of air. The method of measuring pressure inside the tube is entirely electrical and is due to Dr. O. E. Buckley of the Western Electric Company. A low voltage source is connected in series with a low reading ammeter in the plate circuit of an auxiliary tube, the minus terminal of the plate battery being connected to the plate. A source of high voltage is connected in the grid circuit with the positive terminal to the grid, thereby making the grid positive with respect to the

(*Continued on next page*)

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A Simple Set to Take Away On Your Vacation

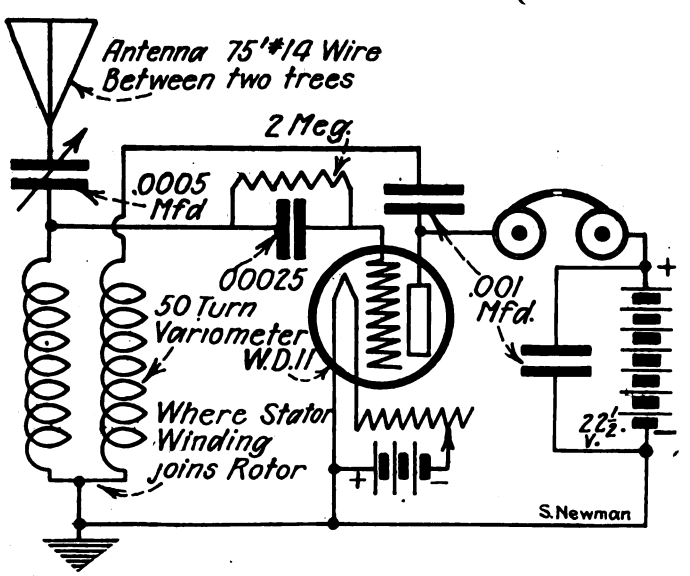
By A. D. Turnbull

FOR the real DX fan nothing will do except super-selectivity and ability to bring them in and lay them down, much the same as the negro in the woodshed when "thay's gonna be chickun on de table."

The little circuit described below, while not a new one in any manner, incorporates several new ideas that will pay the fellows to investigate. With this circuit and the air fairly clear of disturbance, the distance almost knocks at the door begging to be let in, and you have to lock the windows to keep from being smothered.

Of course a lot of you fellows will say that sort of talk is old stuff, and that you have heard it so often that you don't even get a thrill out of it. Well, don't pay any attention to it then, and just try out the circuit, which is all that you need to do, and you will wonder where the circuit has been hiding before.

First of all get yourself a good variometer, with 25 turns of wire on the rotor and a like amount on the stator. In most variometers they use the bearing or post that runs through as a shaft, as a means of connecting the two coils together. Just take a tap off of that lead, and go ahead and hook it up as shown in the diagram herewith.



Mr. Turnbull's new circuit which permits the construction of a simple set with but two controls, yet which will satisfy the seekers of super-selectivity.

When tuning in this circuit it will be noticed that there is a decided tendency of the tube to oscillate violently as the tube is turned past a certain point and the rotor of the variometer brought around to minimum. When this occurs, turn down your filament a bit, loosen the coupling and just bring them in to the delight of everyone. The tuning of this set is so decidedly easy that it is simplicity itself, as the main wave length control is the condenser. If you desire to listen in to 400 meters, set your condenser, and then do the rest of your tuning with the variometer. The direct coupling, through the condenser in the plate circuit, gives capacity coupling which, while not the most efficient means of getting feedback, or regeneration, certainly makes this little circuit bring them in.

In the construction of any single circuit sets, because of their ability to oscillate, it is very hard to operate them so that they do not cause interference with other nearby sensitive sets. I have experimented with many of them, and have found out that you really do not need to have your set oscillating to receive signals strongly. The loudest signals are always received just before the tube spills over or oscillates. This is the most efficient point, and will prevent the other receivers from being heterodyned by your receiver. With this circuit, if it is allowed to oscillate, it will cause lots of trouble with your neighbors, but by not burning your filament up bright, and always keeping the tube just inside the oscillating point, the highest regeneration will ensue and the loudest signals will be received.

If care is taken in the construction of this set, the entire receiver, batteries and all, can be accommodated in one of the smaller suitcases, such as they sell to pack lunches in. Use a neat wood or hard rubber panel and you never need be away without your set.

When you go away, use a bare wire for a ground. Throw it in the stream, stick it in the moist earth, or drive it into a live tree by means of a spike. For the aerial, I have had wonderful success by flying a small kite with a thin piece of wire woven in among the cord, and letting the kite up to 100 or 150 feet. If you can't do that, throw an insulated wire over one end of a tree and let the other end run to your set.

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filament. The filament is then lighted so that electrons will be sent out to the grid, ionizing any air that is in the tube. As the air is ionized the positive ions will be attracted to the plate causing a current to flow in the plate circuit which is proportional to the amount of air in the tube. As long as any current flows in the plate circuit there is air in the tube. The smallest scale division on this ammeter reads a pressure of one one hundredth thousandth of a millimeter of mercury, so by reading the ammeter the amount of air in the tube can be determined in millimeters of mercury.

The testing of these tubes is accomplished by forcing them to oscillate, using a plate potential of about twelve thousand volts obtained by rectifying sixty cycle alternating current. The efficiency varies with the adjustments of the circuit and tube and may be higher than eighty per cent. when all the circuits are carefully designed and balanced. However, this efficiency is exceptional for the adjustments are very difficult to make.

The materials used for the construction were selected after considerable experimenting. Copper was used for the plate because it is very malleable and is not porous until its temperature reaches about six hundred degrees Centigrade. Steel was tried but proved to be too porous at low temperatures so it was discarded as unsuitable.

While the operation of vacuum tubes in parallel presents certain difficulties due to inter-tube oscillations, it must not be inferred that these difficulties are insuperable. Indeed, in the recent successful transatlantic telephone tests, carried out in co-operation by the American Telephone and Telegraph Company and the Radio Corporation of America, in which several speakers in New York talked to an audience in London, England, the power was supplied to the antenna from a bank of twenty water-cooled tubes operated in parallel. These tubes were of 10,000 watts output.

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Class A Stations Now Number 75

By Carl H. Butman

WASHINGTON, D. C.—With the licensing of 21 new Class A stations and the transfer of 22 old ones from Class C, where they were operating on 360, the total number of A's was 75 on May 12.

Call	Station	Frequency Keys	Wave Lengths Meters	Power Watts
W A B G	Arnold Edwards Piano Co. Jacksonville, Fla.	1210	248	10
K F E X	Augsburg Seminary, Minneapolis, Minn.	1150	261	100
W A B C	Fulwider-Grimes Battery	1310	229	10
K F I B	Jenkens, Franklin W., St. Louis, Mo.	1230	244	10
W C B B	K. & K. Radio Supply Co., Greenville, Ohio	1250	240	100
W A B H	Lake Shore Tire Co., Sandusky, Ohio	1250	240	100
W A B F	Mt. Vernon Register-News Co., Mt. Vernon, Ill.	1220	234	250
W B B A	Newark Radio Lab., Newark, Ohio	1250	240	20
K F H L	Penn College, Oskaloosa Iowa	1320	227	10
K F I D	Ross Arbuckle Garage, Iola, Kansas	1220	246	20
W B B C	Sterling Radio Equipment Co., Sterling Ill.	1310	229	50
K F I Q	Yakima Valley Radio Broadcasting Assn., Yakima, Wash.	1240	224	50
W A B E	Y. M. C. A., Washington, D. C.	1060	283	50
K D Z R	Bellingham Publishing Co., Bellingham, Wash.	1150	261	50
W H A L	Lansing Capital News, Lansing, Mich.	1210	248	200
W M U	Doubleday-Hill Electric Co., Washington, D. C.	1150	261	100
W O A C	Maus Radio Co., Lima, Ohio	1130	266	100
W R A L	Northern States Power Co., St. Croix Falls, Wis.	1210	248	100
K D P M	Westinghouse Elec. Mfg. Co., Cleveland, O.	1110	270	250
W F A B	Woese, Carl C., Syracuse, N. Y.	1280	234	200
W L A H	Woodworth, Samuel, Syracuse, N. Y.	1280	234	250
W M A V	Alabama Polytechnic Inst., Auburn, Alabama	1200	250	250
K F G L	Arlington Garage	1280	234	5
W Q A H	Brock Anderson Elect. Eng. Co., Lexington, Ky.	1180	254	10
W D Z	Bush, James L., Tuscola, Ill.	1080	278	10
W M A J	Drovers Telegram Co., Kansas City, Mo.	1090	275	25
W C A U	Durham & Co., Phila., Pa.	1050	286	100
K F F P	First Baptist Church, Moberly, Mo.	1090	275	50
W S A L	Franklin Electrical Co., Brookville, Ind.	1220	246	20
W M A H	General Supply Co., Lincoln, Neb.	1180	254	15
K N T	Grays Harbor Radio Co., Aberdeen, Wash.	1140	263	250
W E A D	Henry Radio & Elect. Supply, Atwood, Kans.	1120	268	100
K F H H	McCue, Ambrose A., Neah Bay, Wash.	1060	283	50
W M A Z	Mercer University, Macon, Ga.	1120	268	50
W O A V	Pennsylvania National Guard, Erie, Pa.	1240	242	100
W B A U	Republican Publishing Co., Hamilton, Ohio	1160	258	50
K G Y	St. Martin's College, Lacey, Wash.	1160	258	5
W Q A F	Sandusky Register, Sandusky, Ohio	1250	240	5
W C A T	South Dakota School of Mines, Rapid City, S. D.	1250	240	100
W H A A	State University of Iowa, Iowa City, Iowa	1060	283	100
W N A N	Syracuse Radio Telephone Co., Syracuse, N. Y.	1050	286	100
W M A L	Trenton Hardware Co., Trenton, N. J.	1170	256	15
W O A X	Wolff, Franklyn J., Trenton, N. J.	1250	240	100

Thirty-four Class B Stations, each with a territorial zone, have been licensed by the Department of Commerce and began operating on May 15th.

The zone waves originally designated for Seattle and Portland have been transferred; Seattle has been assigned the 455 meter wave or 660 kilocycles, and Portland, 492 meters, or 610 k/c.

A special wave for Class B Stations in Madison, Wis., and vicinity may be designated as 345 meters if a station qualifies.

The calls and waves for 34 Class B Stations follow:

	Call	Wave
California		
Los Angeles, Earle C. Anthony	KFI	(395 or 469)
" Times Mirror	KHJ	" "
San Francisco, Hale Bros., Inc.	KPO	(509 or 423)
Mercantile Trust Co	KFDB	509
Georgia—		
Atlanta, Constitution	WGN	429
" Journal	WSB	429
Illinois—		
Chicago, Westinghouse Elec. & Mfg. Co.	KYW	(?)
" Daily News	WMAQ	448
Iowa—		
Davenport, Palmer School of Chiropractic	WOC	484
Kentucky—		
Louisville, Courier Journal & Times	WHAS	400
Massachusetts—		
Springfield, Westinghouse Elec. & Mfg. Co.	WBZ	(337)
Michigan—		
Detroit, Free Press		
" News	WWJ	517
Minnesota—		
Minneapolis, Cutting & Washington Radio	WCF	517
Corp.	WLAG	417
Missouri—		
Kansas City, Star	WDAF	411
Sweeney School Co.	WHB	411
St. Louis, Post Dispatch	KSD	546
New Jersey—		
Newark, Bamberger & Co	WOR	405
New York—		
New York, American Tel. & Tel. Co.	WBAY	492
" Western Electric Co	WEAF	492
" Radio Corporation	WJY	405
" Radio Corp.	WJZ	455
Schenectady, General Electric Co.	WGY	(380)
Troy, Rennselaer Polytechnic Inst.	WHAZ	(380)
Oregon—		
Portland, Oregonian	KGW	(492)
Ohio—		
Cincinnati, U. S. Playing Card Co.	WSAI	309
Pennsylvania—		
Philadelphia, Gimbel Bros.	WIP	509
" Lit Bros.	WDAR	(395)
" Strawbridge & Clothier	WFI	395
" Wanamaker	WOO	509
Pittsburgh, Kaufmann & Baer Co.	WCAE	(?)
Tennessee—		
Memphis, Commercial	WMC	500
Texas—		
Dallas, News & Journal	WFAA	476
Fort Worth, Star Telegram	WBAP	476

Stations with waves in parentheses not definitely assigned.

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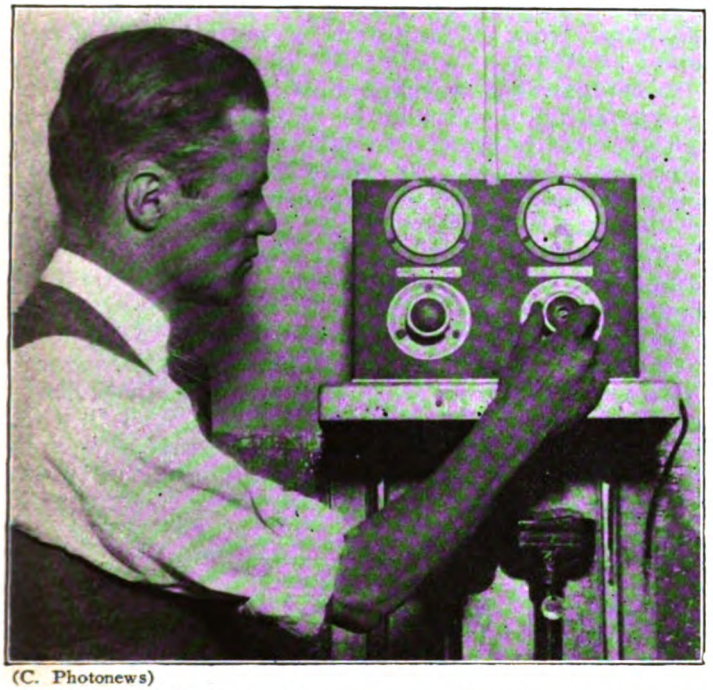
"Broadcast Central," New Super-Radio Station in New York City Dedicated to the Public

"Good evening, Radio Audience, this is WJY, the new station of the Radio Corporation of America, at Aeolian Hall, West 42nd street, New York...." With these words was "Broadcast Central" located atop Aeolian Hall, officially opened to the public at 8:15 on the evening of May 14. The Radio Corporation was enabled through the kind offices of the Second District Radio Inspector, Arthur Batcheller, to officially dedicate this monstrous and wonderful achievement of broadcasting to its place in the hearts of the thousands of listeners. This impressive ceremony, which officially opened the station, was attended by a group of the foremost men in the radio world, a gathering of the very cream of the scientific world, who attended this



(C. Photonews)

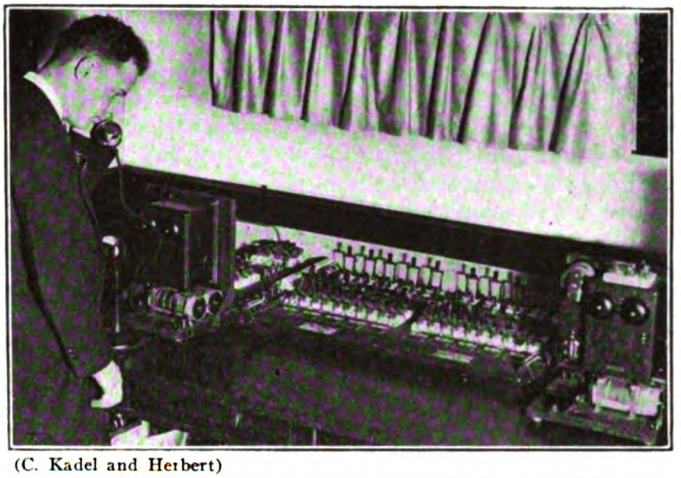
Fig. 1. Operator E. C. Rundquist, of Broadcast Central, operating the oscillograph rectifier which is used to measure the voice waves passing through the amplifiers. There are duplicates of everything in the station for both channels in case of accident.

"house warming party" of the Radio Corporation's new station which will reach out and make happy the hearts of millions of listeners.

The opening speech was delivered by Owen D. Young, chairman of the board of the General Electric Company. He spoke on the tremendous achievement that this opening of the Radio Broadcast Central constituted. He was followed by Major General James G. Harbord, president of the Radio Corporation, who officially dedicated the station to the public service. He said in part: "It is with this thought in mind that I dedicate 'Broadcast Central' to the people of America. I dedicate it with the belief that, in a sense this station represents the world's first national theatre, for now this great metropolis is able to annihilate distance and offer its best talent simultaneously to all parts of the country from the Atlantic to the Pacific Coast—talent that will appeal to the serious minded as well as the gay and light hearted."

Upon the termination of his speech, Dr. Alfred Goldsmith was introduced to the unseen multitudes. He spoke of the many wonders that he had witnessed in the newest of arts and sciences, and of the monstrous work that they had accomplished in making New York City the center of broadcasting. In brief he stated:

"The work of the engineers at 'Broadcast Central' is not completed. It will never be completed. Not only must the standard of the stations be maintained constantly but it must be continually improved. It is the



(C. Kadel and Herbert)

Fig. 2. Control board of the land wires used when broadcasting is being done at points outside of the studio. Any one station or church may be switched on and off at any time. There are two sets—one for the WJZ control and one for the WJY control.

plan of the Radio Corporation of America through continued research and experiment to make the stations at "Broadcast Central" even better and more effective. Radio broadcasting as shown in the present stations here is a splendid achievement, yet it is only the beginning of a great and never-ending development."

(C. Kadel and Herbert)

Fig. 3. New method of holding the transmitters inaugurated at the new radio Broadcast Central. They are held by means of rubber bands to prevent vibration. The cover is of light silk colored to represent the world. Two are provided so that if one fails the other can be switched on.

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How Radio May Unite the Languages of Europe

By Arthur G. Shirt

SUPPOSE—just suppose—that when you light up the tubes in your radiophone some evening, instead of the usual well-known voices of your favorite announcers, you should hear some strange voice spluttering away in Greek, Persian, Turkish, Italian, Spanish, French, Portuguese, or in any one of the many tongues of the continent of Europe? What would you think? Oh, well, you say, that supposition is so remote that it is useless to even consider it. But what would you do if it wasn't a remote supposition, but a painful fact, as it is, or will be, with the radio amateur in central Europe? Although he may have a veritable host of broadcasting stations to choose from, only one or two will be taking in the language he understands. The interference will be something appalling, with a Tower of Babel effect that will do more toward wrecking the popularity of the radio in Europe than a series of earthquakes.

Makes us laugh, here in America, doesn't it? But it has been calmly estimated by various radio authorities that in five years there will be one million radio outfits in the United States capable of receiving speech from Europe, Latin America and the Orient! You may very well be the owner of one of these stations. For the sake of our argument, let us suppose that the European stations came in too loudly to be ignored altogether, and transmit such important speeches on world affairs, economic relations and such that we really want to hear them. Now how about it? Shall we hire an interpreter to translate what comes to us over the ocean by way of the air, or shall we, at the present moment, clamor for a "radio universal language," which will do for the radio telephone what the code does for the radio telegraph?

When the map of Europe and Asia is dotted with radiophone stations, as the map of America is now, will England shout Anglicisms into Persian ears, or will she use a tongue that is not only common to both England and Persia, but to every nation in between who cares to "listen in"? When China and Japan "open up" to address us, will we sign off in disgust, or will we, for once, understand with clear interpretative powers what proceeds from the mouth of the Orient?

Already one broadcasting station has felt the pressure of conflicting languages. CKAC, the most powerful station in Canada, situated at Montreal, transmits in both English and French. The problem of serving different nationalities is easily solved in this particular case, but if CKAC were situated in Switzerland, for example, would it transmit in practically all the known languages of the globe? Very likely not. It would feel the need of and eventually discover a radio language that would be intelligible to each and every one of its vast and widely scattered audience.

What will such a language be like? How will it sound and who will teach it? Why not adopt English as the language of the air? Now, you English-speaking people, test yourselves. Why not French? All these questions have been asked before, but not in connection with radio. For the subject of a world language is almost 300 years old.

The language meeting the requirements should be modern, simple and flexible and readable to a large extent at a glance by any one speaking French, English, Italian, Spanish, German or Russian. At the same time, it must not be impossible to inhabitants of China, India, Japan, or Turkey, who have difficult languages of their own. It should be brief, clear, full but not redundant, and suitable for the needs of travel, commerce, labor and polite intercourse as well as for radio communication. Moreover, so that it may not undo its own purpose by promoting international jealousy, it must be strictly neutral. That is to say, while it may draw from all languages, it must be partial to none.

To be neutral, a language must be artificial. Yet in being artificial, it must not be disagreeable to the ear. Neither must it pretend to take the place of or supplant a native tongue. It should be solely an auxiliary language, adopted for the common expediency of the whole world and for the benefit of that vast army of radiophone listeners, who, when they give their attention to a station, want to know what it is talking about.

All these qualifications sum up into quite a big bill, but there are three artificial languages in existence today which fill it more or less satisfactorily. They are Esperanto, Ido and Idiom Neutral. And in the light of present day radiophone development, it is not at all unlikely that one of these three will be chosen as the language in which the radiophone of the future will speak.

More Standard Waves for Calibrating Sets

WWV at the Bureau of Standards, Washington, D. C., will again transmit radio signals of standard frequency on the nights of May 29 and June 4 and 11, for calibrating wave meter and adjusting receiving and transmitting apparatus. Detailed information on methods of standardizing sets is available in Circular Letter 92 which may be obtained upon application to the Bureau at Washington.

The schedule includes the transmission of the following wave lengths starting at 11 P. M. Eastern Time each night and continuing until 12:41 A. M.:

	May 29	June 4	June 11
Kilocycles	1400	900	400
Meters	(214)	(333)	(750)
Kilocycles	1500	1000	500
Meters	(200)	(300)	(600)
Kilocycles	1600	1100	600
Meters	(187)	(273)	(500)
Kilocycles	1700	1200	700
Meters	(176)	(250)	(428)
Kilocycles	1800	1300	800
Meters	(167)	(231)	(375)
Kilocycles	1900	1400	900
Meters	(158)	(214)	(333)
Kilocycles	2000	1500	1000
Meters	(150)	(200)	(300)

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A Single Tube Reflex of Great Selectivity

By W. S. Thompson

[The author informs us that he has received hundreds of letters from radio fans complaining of the lack of selectivity in the one-tube reflex set. He therefore has prepared the following article as a solution of this problem. He states that the set here described is the most selective non-regenerative set he has ever used which does not make use of a multitude of controls.—EDITOR, RADIO WORLD.]

THE modern receiving set should be selective above all other requirements, for no matter where a set may be located, there will be interference of some kind which must be tuned out before any desired signal can be received, with any degree of success. Another advantage of the highly selective receiving set is that it will be less affected by summer atmospherics.

The regenerative receiver has an advantage over the non-regenerative in this respect, for regeneration in itself makes the set selective to a high degree. Therefore, the non-regenerative set must incorporate some other means of acquiring the selectivity which it does not have due to feed back action. The reflex circuits have become popular almost over night, so today they are, the writer believes, the most popular of the non-regenerative sets. They have many advantages over a great many of the other sets, but to compete with the feed back circuits, they must be very selective. The worst offender along these lines is the single tube reflex, which, however, can be so designed that even this disadvantage can be overcome.

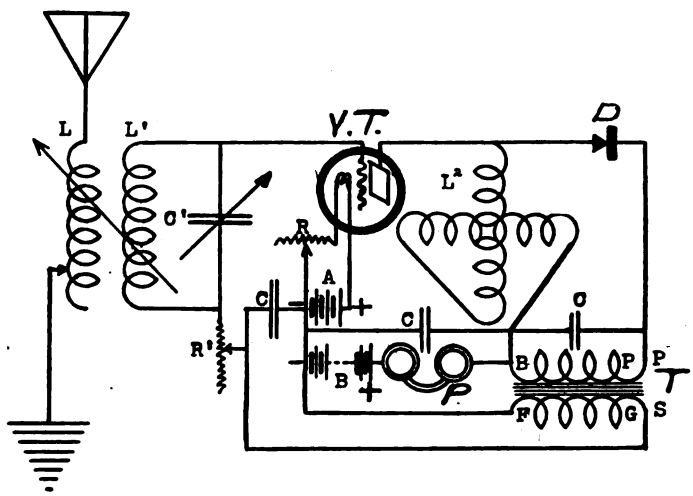
The hook-up shown in the diagram herewith is for a one tube reflex which will enable any user to tune out almost any interference and will eliminate atmospherics to a great extent if properly handled. The parts used are given below and lettered corresponding to the lettering in the diagram.

L —Tapped primary of a vario-coupler.
L'—Secondary of coupler rewound with 65 turns.
L²—Variometer.
C'—Variable air condenser (vernier) .0005 mfd.
C —Fixed mica condensers .002 mfd.
R —Filament rheostat 30 ohms.
R'—Potentiometer.
A —Filament battery (three dry cells).
B —Plate battery (45 volts).
D —Crystal detector.
T —Audio frequency transformer.
P —Telephone receivers.
VT—Vacuum tube (UV-199) and socket.

There are of course other tubes which may be used in this circuit, depending upon the experimenter's choice. In case any other tube is used, the values given for the filament battery and filament rheostat will have to be changed to suit the tube used. Higher plate voltage may be used and is recommended although a "C" Battery in the grid circuit will be necessary in this case.

The primary of the variocoupler should be so tapped that the number of turns can be varied one at a time. This can be accomplished if two multipoint inductance switches are used, one for coarse and the other for fine tuning. The popular variocoupler on the market at the present usually has about twenty or thirty turns of wire on the rotor. The rotor therefore, will have to be rewound using smaller wire or by bank winding until there are 65 turns of wire on it. The set will tune more sharply if the rotor is bank wound, using a larger size wire because the added resistance of the small size wire will detract from the selectivity of the set. The secondary is tuned with a vernier condenser having about 23 plates. The vernier will enable the user to do much finer tuning which may mean the difference between hearing and not hearing a distant station or between hearing one or two stations at once. Another tuning control is the variometer which is placed in the plate circuit of the tube. By using a variometer for the radio-frequency coupling, there are several advantages gained. The experimenter will usually find that the signal strength is greater using this method of coupling, rather than transformer coupling. One reason for this is that it is very difficult to design a transformer coupled set which will give satisfactory voltage amplification through the transformer. Another advantage lies in the fact that the variometer can be used for tuning out undesirable signals.

The potentiometer R' which is connected in the grid circuit may or may not be necessary. If the experimenter is very close to a high-powered station, this potentiometer will stabilize the set and prevent the tube from oscillating. Any very loud signals tend to make the set unstable so the resistance of the potentiometer will have to be adjusted for each different intensity of signal strength. If great care is taken to keep all grid circuit wires away from the plate circuit wires and by using the tube recommended, no trouble due to instability should be encountered.



A highly selective reflex circuit using one tube and a crystal detector.

In tuning this set, remember that any set will be more selective and less affected by atmospherics when the coupling between the primary and secondary is very loose. For this reason a variocoupler has been used and by its use signals otherwise unintelligible will be pulled through persistent interference.

In selecting a crystal detector, there are several points which should be kept in mind regarding the mounting. The crystal should be firmly mounted in a cup so arranged that this cup can be removed at any time without great difficulty. The cup should be held firmly in the mounting so that there will be no possibility of the cat whisker losing its adjustment. The cat whisker which can consist of one small wire or a bundle of small wires, should be mechanically rugged and have some arrangement by which its pressure on the crystal can be adjusted. The best results seem to be obtained when the contact is very light although the adjustment is very easily disturbed in this case.

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WOAW, the Fine New Broadcasting Station of the Woodmen of the World

STATION WOAW, of the Woodmen of the World Life Insurance Association Headquarters at Omaha, Nebraska, has been on the air since April 2nd, when it was officially opened. Since then it has attracted the notice of "listeners in" in every part of the United States as well as distant outside points. WOAW was designed and constructed by the Western Electric Company engineers who established communication between Arlington, Virginia, and Paris, France.

(C. Western Electric)

Fig. 1. The antenna system of station WOAW, the new broadcasting station of the Woodmen of the World, at Omaha, Nebraska.

The Woodmen of the World Life Insurance Association, while fundamentally interested in insurance, has demonstrated its policy as being more than an insurance proposition. In fact, the policy of the Woodmen of the World Life Insurance Association is to keep pace with progress in all lines of human endeavor. The War Memorial Hospital to be officially dedicated at San Antonio, Texas, July 4th, has been constructed by the Woodmen of the World to care for members who have been disabled by disease. It marks a new step in the history of fraternal insurance. Plans are also being laid by the executives of the Woodmen of the World for a home for the aged members of the Society and for orphans of Woodcraft. Another feature introduced by this Society is the extension of loans to members to enable them to build their own homes. The construction of Radio Station WOAW was the culmination of this policy.

Over $50,000.00 has already been expended in equipment and management of this station and the officers are sparing no funds to make it one of the best privately owned commercial radio stations broadcasting in the United States.

Not only have the distance attempts met with satisfying results, but success has been achieved in procuring diversity and high quality in the broadcasting programs, as is testified by the expressed approval of "listeners in" from every state in the Union, as well as Canada, Mexico and Cuba. Station WOAW, in spite of the brief period of operation, has already reached such distant points as Los Angeles, Vancouver, Miami, Bangor, Newfoundland, Quebec, Porto Rico, Havana, Guadalajara, Mexico and Nova Scotia.

The farthest distance reception of WOAW acknowledged was a message from the radio operator on the S.S. "White," at that time located 1,200 miles south of San Pedro, California, making an approximate bee line of 3,000 miles from Omaha.

That WOAW attracted the attention of radio fans extensively is indicated not only from the point of its

(C. Western Electric)

Fig. 2. W. A. Fraser, Sovereign Commander of the Woodmen of the World, making the dedication speech at the opening of the new WOAW broadcasting station.

distance acknowledgments, but also in view of the vast number of letters, telegrams and telephone calls which have flooded the headquarters. During the first week of broadcast more than 50,000 of these communications had been received at the offices and a force of 10 telephone girls, 15 typists, 10 stenographers and numerous

(Continued on next page)

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An Army in the Field Depends Upon Radio

By Carl H. Butman

EFFICIENT communication in the army is coming more and more to depend upon radio, and in order to keep abreast of its rapid development the Signal Corps of the United States Army maintains a complete and modern radio research laboratory at Camp Alfred Vail, N. J. Here the development of new and special apparatus for the several arms of the service is planned and perfected. A number of America's foremost radio engineers are engaged in the laboratory upon radio problems. A radio school for military students is also conducted at Camp Vail, where men from the different corps are trained as experts.

Functions of the Signal Corps do not comprise radio communication solely, but include all means of signaling running from visual, through the pigeon service, line telegraphy, cables, telephone work, including field service to the latest methods of radio communication. The Signal Corps also includes meteorological and electric time services.

In time of war, a signal officer pointed out recently, victory or defeat has sometimes hung upon the transmission of a single message, and the importance of communication is so great that no engagement can be successful without a well-planned system of communication. In the army efficient communication systems are maintained in time of peace as well as war. This makes it necessary for the Signal Corps to keep up to date and, when possible, to be a little ahead of the times. Many commercial devices and systems now used were originated in the Signal Corps for military use long ago.

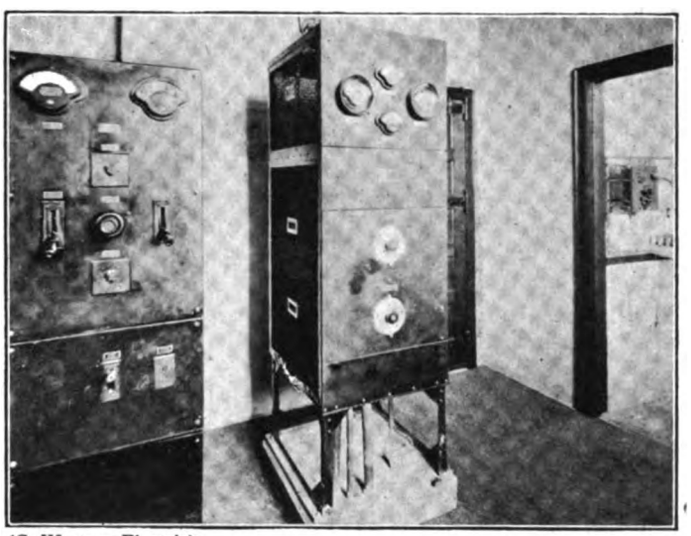
Today a network of radio stations extends to all quarters of the country, with a message center in Washington. High powered stations carry dispatches from coast to coast in record time, and no military command is out of touch with Washington for an appreciable length of time.

The installation of a system of modern 1½ kilowatt vacuum-tube stations connecting all centers of military activity has been practically completed. For the transcontinental circuit stations have been established at New York, Washington, Indianapolis, Omaha, Salt Lake City and San Francisco, with one nearing completion at Cheyenne. Similar stations have also been installed at Atlanta and St. Louis. In addition, all the important aviation fields will soon be connected with the radio system. Most of the big stations are equipped with remote control apparatus permitting operation of a transmitter at some distance and the reception of incoming messages by loops and six stage radio-frequency amplifiers in the main offices. Communication is maintained through these sets by means of the continuous wave telegraphy method, but the stations are also equipped for radio telephony and buzzer, modulated radio telegraphy.

The importance of radio to an army in the field was shown during the operations of the First American Army in the Meuse-Argonne battle, when six hundred radio receiving sets were used for receiving airplane reports alone. The operation and maintenance of these receiving sets required the services of about 5,000 radio specialists, most of them recruited from the ranks of American amateurs at the outset of the war.

Radio for communication between infantry regiments and battalions is the most important link in action. Front line wired telephone and telegraph communication is constantly interrupted by shell fire and bombs. Farther to the rear, wire communication is more dependable and there radio becomes more of an auxiliary service.

With the exception of brigade to regiment communication, which is spark radio, all ground radio within an American field army is of the vacuum tube or continuous wave type.



(C. Western Electric)

Fig. 3. Partial view of the transmitting room of the new station of the Woodmen of the World at Omaha. A standard Western Electric transmitter is used.

In army corps headquarters, as well as large artillery and air units, powerful vacuum tube sets installed on tractors are employed. Divisions and regimental units in the field are equipped with compact chest-type tube sets. In advanced posts, "V"-shaped antenna supported by 20 foot bamboo poles are used.

(*Continued from preceding page*)

other general employees was necessary to cope with this enormous volume of communication. Over 300,000 pieces of mail matter have left Station WOAW in answer to communications from radio fans.

The studio is divided into four rooms—reception room, artists' room, operating room and power plant. The reception room and artists' room are furnished with beautiful velvet lounges and mahogany chairs for the convenience of both performers and visitors or guests of honor. Gorgeous draperies of plush are used not only for purposes of decoration, but also to muffle all sounds. Sound-proof glass doors and heavy rugs make the studio practically sound-proof at all times.

At the present writing one of Nebraska's well-known artists, Mr. Henri Domshyte, is painting a series of canvases for the studio. Mr. Domshyte is a modern impressionist and his work has been attracting much attention of late. In view of the fact that his pictures are being made to fit the color scheme of the studio as well as to express his philosophy of painting, it is expected that thousands of people will visit this studio not merely to learn about the radio station, but also to satisfy their interest in art. In fact, WOAW is claimed to be the only station in the country that can boast of this unique decorative arrangement.

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A Simple Variable Grid Leak

By "Sigma"

TUBES of various makes require different values of grid leaks. These values vary from 1½ to 5 megohms, and the correct size can be found only by experiment. Although different leaks manufactured in cartridge form are very good, there is the expense to look at, as several would have to be bought of different values while only one would be used. For this reason the leak described below should be very popular and, in addition, the appearance is not an eye sore.

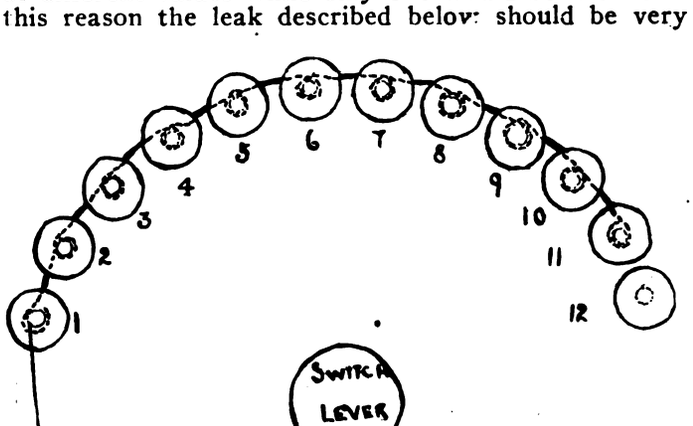

Fig. 1. Method of making a variable grid leak by fastening an India ink soaked string under the nuts of tape.

The parts to make up this piece of apparatus are easily obtainable and should not cost more than an ordinary grid leak. The following will be required: A switch lever, 12 contact studs with two washers each, about a foot of thin twine, some India ink and the hard rubber or other insulating material for for mounting.

Drilling the holes to mount the switch lever and contact studs is carried out in the usual manner. The twine is soaked in India ink and allowed to dry. When perfectly dry it is taken between the washers on the contact studs from 1 to 11, the last stud being left disconnected. The leak should now be connected to the condenser as shown; thus, when the switch is at 1 the condenser is short-circuited, while from 2 to 11 different values of leaks are obtained. When on stud 12 the leak is entirely disconnected; thus all the combinations normally required are easily obtained with a simple and cheap piece of apparatus, which the average experimenter can make up in about an hour.

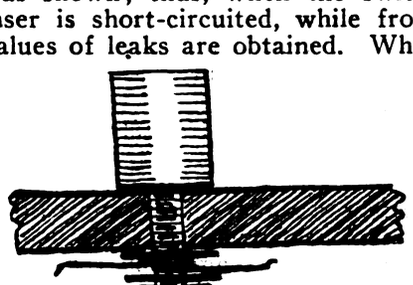

Fig. 2. Method of fastening the string to get good contact. It is wrapped around the shank under the washer.

Importance of Minor Things in Radio

By R. L. Dougherty

FEW people, either when they are constructing or operating a radio set fully realize the importance of some of the "minor things" they overlook or carelessly neglect. Some of these things may appear trifling but when they are multiplied together it is a wonder that some sets even as much as peep. A few of the "minor things" are:

Using too much flux when soldering connections. This causes a high resistance leak because of the habit of the flux to spread and collect dust and dirt, thus lowering the efficiency of the set.

Not soldering connections. Brass and copper have the habit of corroding. When you make a connection and simply fasten it under a screw, you are courting high resistance because the metallic parts will corrode. *Solder all your connections.*

Not insulating your lead-in properly. People have a bad habit of just letting their lead-in come through the top of an open window, touching the walls. In general they bring it in "any old way at all." Were you to visit a commercial station, or take a look at the radio shack aboard a naval vessel, you would note the fact that the lead-in was very well insulated by insulators hanging from the ceiling, or some other method, and that also the inside lead-in was of very heavy copper wire, No. 2 or No. 0 being used.

Letting dust collect. Many sets do not receive a good cleaning from the time they are installed until they are broken up or relegated to the "junk pile." Dust collects between the switchpoints, binding posts and every place possible, forming innumerable paths of escape for the minute currents and seriously cutting down the efficiency of the set.

Insulating. Where leads cross on the interior of a set in close proximity, it is better to use a few inches of insulating material in the form of spaghetti or rubber tubing than to take chances of a short when the set is moved or an adjustment changes some interior part of the set. An ounce of precaution, or an inch of insulation, is worth $6.50 or a couple of new tubes or a new pair of phones.

Phones. These devices were constructed as a means of hearing signals, not as a means of showing your friends how much you know about the workmanship of different parts. Do not take off the ear pieces, tap the diaphragms, or fool with the wiring, unless you understand just what you are doing. The phones took a couple of hours of an expert's time to adjust and your taking the caps off destroys his work. Phones are sensitive instruments and wired with copper wire that is finer than the hair on a man's head. They will not stand abuse. Do not test them out by putting them across a battery. They will click if you simply touch the two ends to your tongue, and rub the terminals together. If they don't work, after you have been using them, take them back to the manufacturer and let him fix them. He will be able to do it—but not if you try to do it first.

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A CW Hook-up That Really Works

By R. W. Emerson Decker, 2UA

THERE have been so many different hook-ups and various suggestions about CW sets that the novice starting in the transmitting game is really bewildered.

For CW work an aerial of about sixty to seventy feet should be used. Four wires spread three feet apart is necessary. Good porcelain insulators should be used and the guy wires should be broken up with insulators every ten feet or so. This tends to stop the reradiation which is common with CW transmitters.

The lead-in should be a cage about six inches in diameter and carefully insulated throughout. Be very careful when bringing it through to the set.

A counterpoise should be used and this should be also carefully insulated. This should fan out under the aerial for a diameter of about forty feet and should extend past the aerial a few feet. The height of the counterpoise from the ground should be about ten to fifteen feet. If the space about the station does not permit the erection of the counterpoise under the aerial have it at right angles; it works equally as well and the wave seems to be sharper.

Now that we have the aerial and counterpoise ready we should start on the transmitter itself.

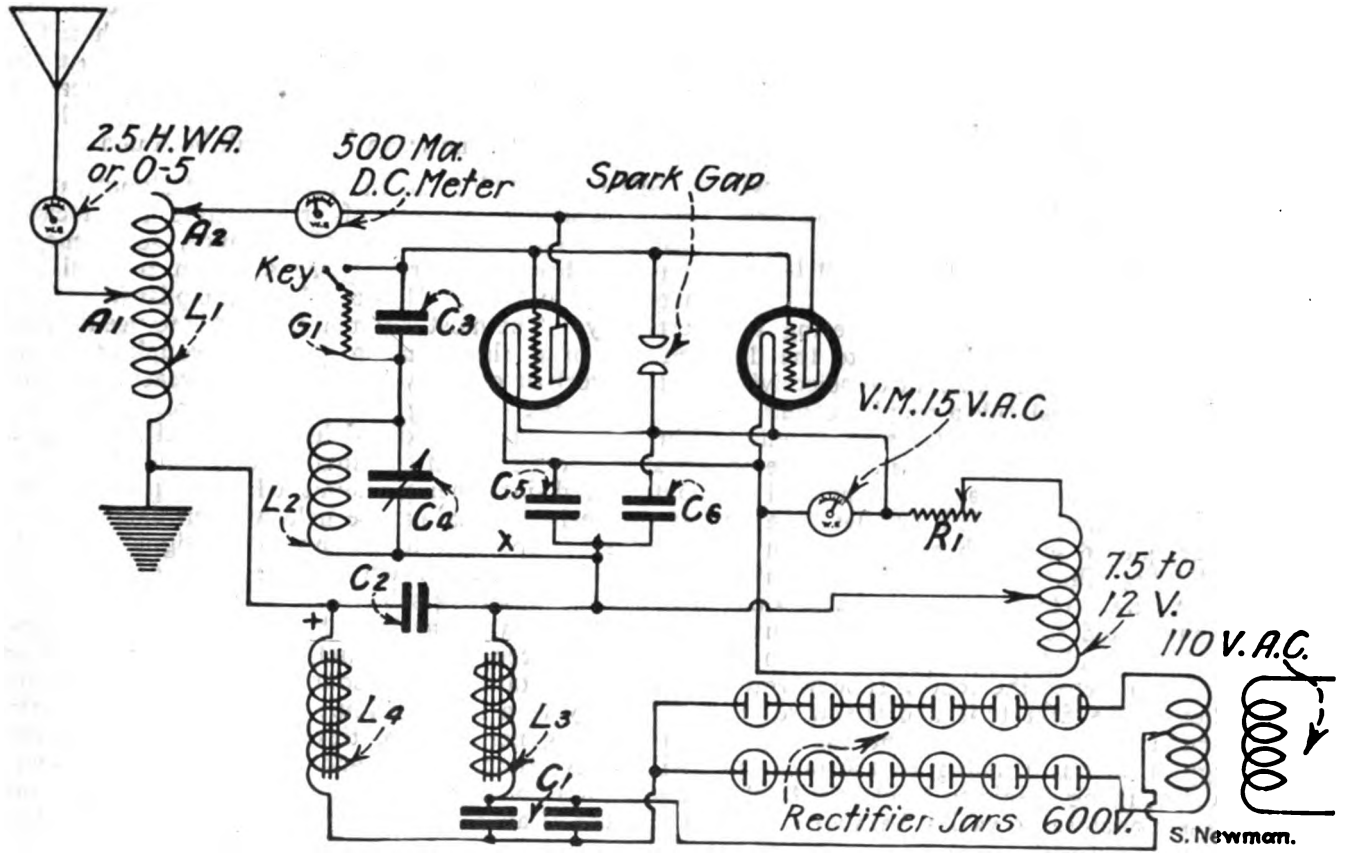
The circuit used here is very easy to operate and adjust and will work with practically no adjustment, but with some hard study and careful tuning will step out in great style. This hook-up can be used with five-watt tubes or the next size, 203 or fifty watters.

On looking the circuit over it is easily seen that L^1 is the main inductance. This is a tube 7 inches long with 30 turns of No. 10 BSC wire. A point here to remember is to insulate this thoroughly. It should be six inches in diameter.

There has been quite some argument on the merits of ribbon or heavy wire for inductance, but wire is generally used.

L^2 is the grid coil and is made with fifteen turns of wire on a tube slightly smaller in diameter than L^1. This coil is placed in the bottom of the main inductance and the wire should be wound in the opposite direction to that of the other coil.

L^3 and L^4 are iron chokes, 1½ henry, and 500 M. A. C^1 and C^2 are 1 mfd. condensers. The Western Electric 21-A.A. condensers can be used here and work very well.



A neat and powerful CW or phone transmitter circuit. If you have been looking for an efficient transmitter construct this and you won't go wrong.

C^3 is a mica or air condenser of .0005 or .005 mfd. capacity; C^4 is a variable condenser of about .0005 to .001 mfd.

C^5 and C^6 are .001 fixed paper condensers.

G^1 is the grid leak of 10,000 to 15,000 ohms resistance. R^1 is a heavy rheostat. This should be able to carry 5 amperes continuously without heating. While some claim a rheostat is not necessary here, it is much safer to use it as the voltage may change at times and a rheostat is cheaper than burning out tubes.

A^1 is the wave length tap; A^2 controls the coupling; the hot wire meter should read to 0-2½ or more. The meter near A^2 is a 500 M.A. D.C. meter.

An AC 10 to 15 volt meter should be used in the filament lead, as in the diagram.

At the point marked X the lead may be broken and the secondary of the modulation transformer inserted.

(*Continued on next page*)

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Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained in Plain Language for the New Radio Enthusiast

By Lynn Brooks

ABSORPTION: The loss of electrical energy radiated into space, due to the electric conductivity of surrounding objects. This effect is noticeable more in congested districts containing a number of steel or metallic structures, or objects that will conduct and absorb the energy radiated into space. It is very noticeable in places where there is a great deal of foliage, such as in or near forests. Absorption is frequently the reason for some signals being received from certain distances more easily than from others, and if you receive signals easier from the south than from the north a survey of the surrounding country will nine times out of ten prove that some intervening body, such as a forest, or a number of tall buildings is absorbing most of the energy from the northern point before it gets to you.

VARIOCOUPLER: A method of transfering the received energy from the antenna circuit to the detector circuit must be had if any amount of selectivity is to be achieved. To accomplish this a coupler generally is used. A coupler consists of a tube (stator) on which is wound numerous turns of wire. The inductance on this tube is varied by means of tapping it at various places. Inside of this tube there is a smaller tube or ball (called a rotor) placed so that it may freely rotate inside of the first tube. On this there is also wound a number of turns of wire. The wire on this tube is not variable, but is calculated to cover a certain number of wave bands and is variable by capacity when shunted by a condenser. In use, when the central tube or rotor is exactly parallel to the first tube and the wires in both tubes are running in the same plane the transference of energy from one winding to the other is maximum, and the coupling is said to be close. As the rotor is turned the transference varies, because of the inability of the lines of force generated by the first tube to cut as many wires as before, and the tuning is then said to be loosened. When the two coils are at right angles, the transference is at its minimum.

WAVE METER: A wave meter is a device by which it is possible to measure the frequency of an emanated electrical wave. It generally consists of an inductance of fixed value, a variable capacitance, a means of detecting or rectifying the impulse and a pair of phones, or small glow lamp so as to enable the user to determine when the circuit to be measured and the measuring circuit are in perfect resonance. On the condenser is placed a scale reading from 1 to 180°. This is generally plotted in the form of a curve on a graph in terms of an empirical scale. The coil of the wave meter, the constants of which have first been checked and the wave length plotted against a standard instrument, is placed near to the instrument to be measured, and the condenser is varied. If a received signal is to be measured, the detector and phones are used, and if a transmitter is to be checked, the small lamp is used in place of the phones and detector. As the condenser is rotated, the signal will be heard in the phones, or the small lamp will light up. At the point where the transference of energy is the greatest, the two circuits are in perfect resonance, and by looking at the scale, the wave length will be found.

SELECTIVITY: In the reception of signals, especially where a number of transmitters are located within a comparatively small distance, some means must be had of separating the different transmitters from one another. This can be accomplished in several ways. The most common method is to use a tuned circuit, or a circuit using inductive coupling rather than direct or capacity coupling. The reason for this is that as the coupling can be varied directly between the antenna circuit and the detector circuit, the signal that is undesired can be reduced to a minimum, without desired signal being diminished to any great extent. If the desired signal can be held without decreasing it in direct proportion to the undesired signal it is apparent that it will drown out the other or undesired signal. In obtaining selectivity in a circuit it is sometimes necessary to sacrifice the volume of a signal, but this is balanced by clear and untroubled reception of the wanted station. It is sometimes possible to obtain selectivity in a single circuit receiver because of the circuit's regenerative abilities. A regenerative circuit will always tune sharper and is therefore more selective than a non-regenerative one, but at the same time it has the disadvantage of re-radiating.

(*Continued from preceding page*)

The transformer secondary should be shunted with an .001 condenser. The transformer secondary should be short circuited when CW is used. It will also be necessary to change the value of the condenser C^4 every time the set is changed from voice to CW.

The rectifier used is the electrolytic type. The plates should be about three inches long and from ⅛ to ½ inch in width. They will pass 200 M.A. easily if about 1-32 of an inch in thickness. A point here necessary to advise is to use only pure aluminum and lead. Distilled water must be used.

The solution is made up of borax and water and it is also well to get good borax. If there is sparking in the rectifier it shows that poor aluminum has been used. Overheating and a great loss of efficiency will then take place.

L^4 and L^3, together with the condenser C^1 and C^2, will make a good filter system and will take the ripple out.

If U.V. 203, the 50-watt tubes are used, the grid leak may be left out at 750 volts, while with 1,000 volts plate current the grid leak should have a resistance of 250 ohms. If one tube is used about 500 ohms will be sufficient.

The condensers in the filter system will have to stand at least 2,500 volts.

This CW set is the best for short waves and it is fine for the 150 to 200 meter work.

Rectifying tubes can be used in place of the rectifier, but are more expensive to use than the jars.

If the set is put into a panel it will present a very fine appearance, but first the set should be experimented with and carefully wired so that no high resistance joints be made.

At a local station this hook-up was used with two five-watt tubes and a DX of 2,000 miles was obtained.

Be sure that you have wired the set correctly before testing out the tubes, as a mistake can easily be made, and a burned out tube may be the result.

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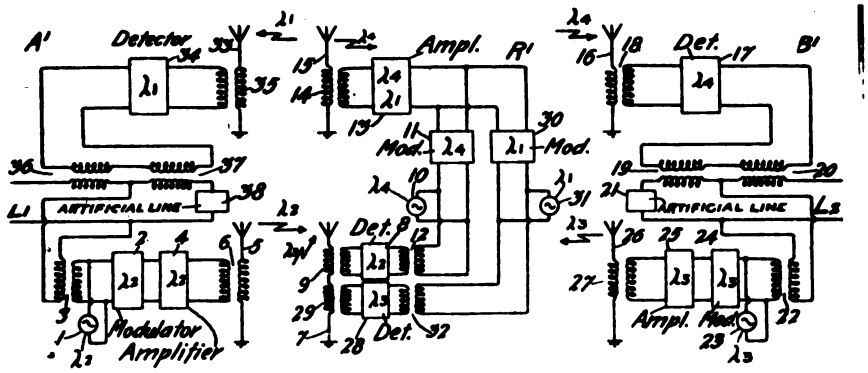
Latest Radio Patents

High Frequency Signaling

No. 1,452,857: Patented April 24, 1923. Patentee: E. H. Colpitts, East Orange, N. J.

THIS invention relates to high frequency signaling, and more particularly to the relaying or repeating of telephonic messages transmitted by means of high frequency carrier oscillations, modulated in accordance with the form of the message wave.

this by receiving at a repeating station a modulated wave transmitted from either or both of two terminal stations. On receiving a modulated wave at the repeating station a new carrier frequency is substituted having a value different from the carrier frequency for which the repeating station's receiving apparatus is tuned. In other words,



Colpitts' new method of modulating telephone signals.

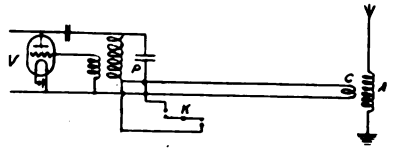
It is an object of the invention to provide a system for two-way repeating and to prevent, at a repeating station, a useless local circulation of power, which gives rise to the objectionable phenomenon known as "singing."

The invention provides for accomplishing the receiving apparatus at the repeating station will not be receptive to the carrier wave transmitted from that repeating station, and the objectionable local circulation of power is prevented. However, the new carrier wave is received at the proper terminal station.

Wireless Transmitter

No. 1,452,900: Patented April 24, 1923. Patentee: W. T. Ditcham, Twickenham, England.

THIS invention relates to wireless transmitters of the inductively coupled type. In accordance with this invention the in-



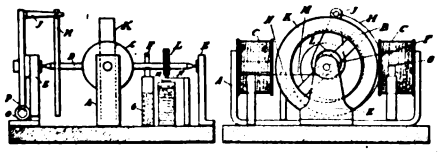
W. T. Ditcham's method of using inductive coupling in sustained wave transmission.

ventor utilizes a primary and a secondary circuit, in which a portion of the inductance of one of the circuits is extended to affect the other circuit, and means is provided for short-circuiting the extended portion for the production of signals.

Wireless Telegraph Calling

No. 1,452,925: Patented April 24, 1923: Patentees: W. H. Nottage and T. D. Parkin, Chelmsford, England.

THIS invention relates to wireless telegraphic calling devices of the type in which impulses are transmitted at regular



W. H. Nottage's system of calling or ringing bells by radio at predetermined times.

intervals and are received by a balance wheel relay, or the like, which has a natural oscillation period equal to the interval between successive impulses so that, though the relay may be unaffected by ordinary signals, yet when a train of impulses at predetermined intervals is incident upon the receiver the oscillations of the relay are increased by the impulses sufficiently to enable it to actuate a bell or other signal or operate in some way an electric circuit for the control of apparatus.

According to this invention we employ for transmitting and receiving the impulses timing mechanism, comprising a spring controlled balance wheel oscillated by an electromagnet, the circuit of which is interrupted by the oscillations of the wheel.

Telephone Receiver

No. 1,452,859: Patented April 24, 1923. Patentee: Lambert Schmidt, Brooklyn, N. Y.

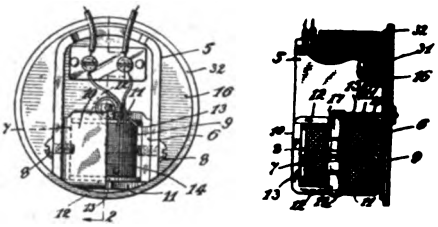
THIS invention relates to a loud-speaking receiver for use in connection with apparatus employed for the purpose of establishing wireless telephonic communication.

Generically considered, it is the primary object and purpose of the invention to provide a receiver of the magnet type which will be highly sensitive and instantly responsive to the slightest variations in polarity of the alternating currents coming in over the line.

More particularly the invention comprehends a radically new form and construction of the armature, having a resiliently balanced suspension in the bore of the translating coil spool. This armature is of cylindrical form, and the pole shoes of the permanent magnet are so related to the ends of the armature at opposite sides thereof that the magnetic flux, acting over a relatively small area, produces an instantaneous responsive movement of the armature to the slightest pulsations of the alternating currents passing through the translating coil.

As a detail item of improvement in instruments of this character, the inventor provides a two-part armature and fulcrum means therefor, which is secured and held in assembled relation with the armature parts when the latter are connected so that the armature and its fulcrum in fact constitute a single unit and capable of assemblage in operative position by the mere insertion of the armature through the bore of the coil spool.

In general the present improvements provide a telephone receiver as above characterized, which, though highly sensitive in its



New method of locating the magnets of a telephone with regard to the diaphragm.

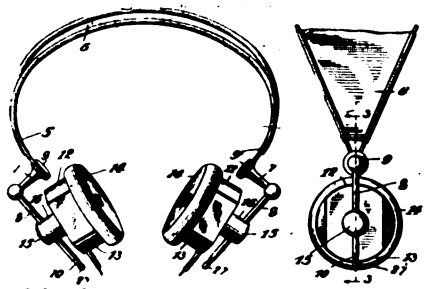
action, is nevertheless composed of simply and substantially constructed elements which are capable of operative association in very compact relation and may be confined within a casing of appreciably smaller size than it is possible to use in instruments of this character as heretofore constructed.

Head Receiver for Telephones

No. 1,452,851: Patented April 24, 1923. Patentee: Lambert Schmidt, Brooklyn, N. Y.

THIS invention relates to head receivers for telephones, and is more particularly designed for use in connection with radiotelephone apparatus, though not necessarily limited in this respect. It is the primary object and purpose of the present invention to provide a head receiver for telephones of that type wherein the two receivers are connected by a more or less elastic or flexible head band or bridge.

More particularly it is the aim and purpose to provide an improved adjustable connecting means between the receivers and the



Schmidt's flexible headband for telephone receivers.

ends of the head band whereby the receivers may be readily positioned in accordance with the size or physical peculiarities of the wearer's head so that they will fit snugly against the ears and thereby exclude extraneous sounds or noises.

Radio Supervision in Samoa

ALTHOUGH the radio regulations for New Zealand have been extended to apply to Samoa, it is reported that more latitude is given the amateurs, and that an effort to regulate broadcasting stations is being made before interference begins. Samoa is designated as the Fifth New Zealand Radio District, with the officer in charge of the Apia radio station as inspector of local reception and transmission.

Except that it is necessary to secure a license and pay a small license fee, amateurs are unrestricted in radio reception; but licenses are not to be issued for circuits which cause interference. Amateur transmitting stations in Grade I require the supervision of a licensed operator.

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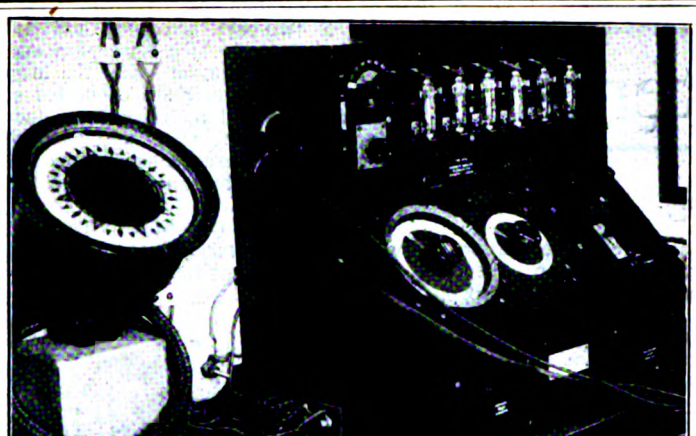
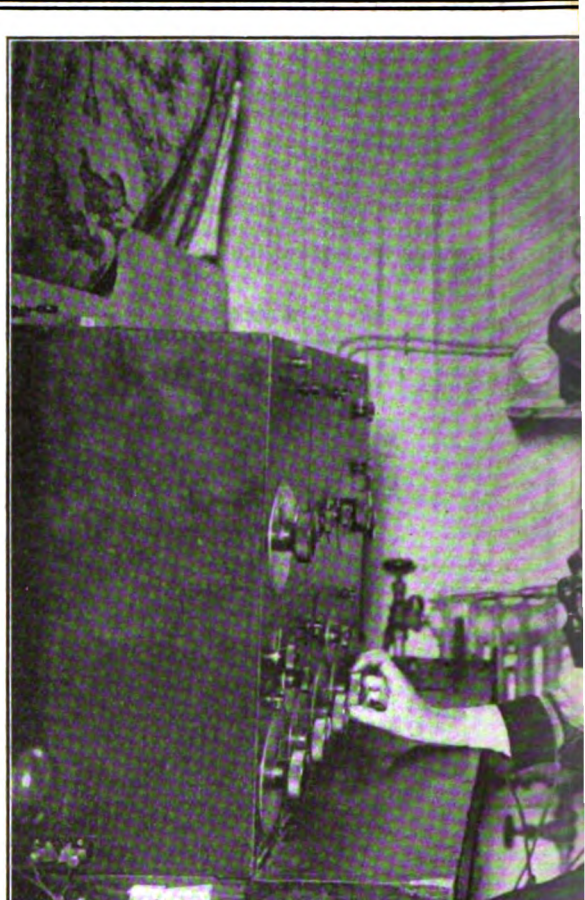
Hoover Allocates the W

Captions by Rob



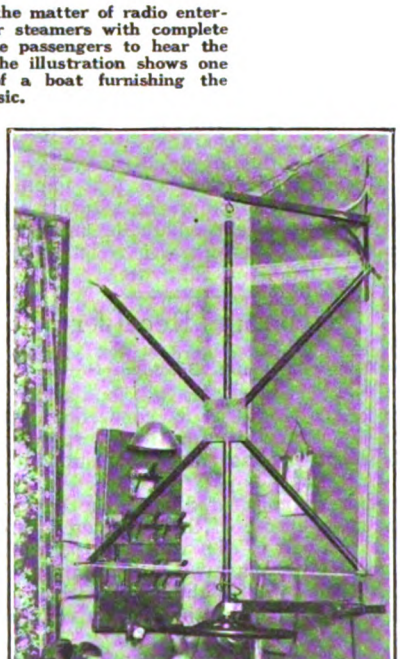
(C. Kadel and Herbert)
One of the seven wonders of the seas, and one of the most important and up-to-the-minute devices—the Radio Compass. The illustration shows the latest aid to maritime men, the "DF" or Radio Compass. The machine is a Sperry gyro repeater in connection with a powerful receiver built so that direction effects are charted right in front of the operator's eyes without any figuring or mapping.

(C. Keystone Views Co.)
France has gone the radio world one better in the matter of radio entertainment. They have equipped the Seine River steamers with complete receiving sets with loud speakers to enable the passengers to hear the local and long distance broadcast programs. The illustration shows one of the loud speakers located on the deck of a boat furnishing the passengers with radio music.

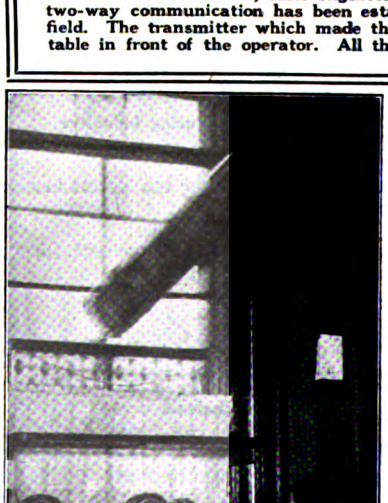


(C. General Electric)
The S. S. "America's" duplex transmitter. A two-way conve E. F. W. Alexanderson, chief engineer of the Radio Corporatio two-way communication has been established between ships at field. The transmitter which made this feat possible is shown table in front of the operator. All the controls for both the r the o

(C. Kadel and Herbert)
Folks, meet "Jiggs," the versatile mascot of the U. S. Marines, who is taking his "daily dozen" (?) via the air. He used to be a favorite with the aviation forces until they started in to broadcast, when he promptly deserted the air for "the airs from the air."



(C. Kadel and Herbert)
Here is one way to beat atmospherics this summer, as shown by Wendall Kilmer, a New York amateur. He has mounted his loop on brackets and suspended it from the wall. Because of a loop's directional effect and the ease with which such a set (3 tube radio frequency) is manipulated great distances can be covered.



(C. Photonews)
Edward Kelly, of New York City, has solved the antenna problem. Living in a crowded section, and unable to erect an aerial (he has a landlord, too), he simply wound a large tube with wire, and attaching one end to his receiver succeeded in bringing in all the DX stations.

Radio fans and enth Batcheller, of New V visor of the Second gentleman is the a all he hears" and it the Second District successful allocation broadcasters, and t interferenc

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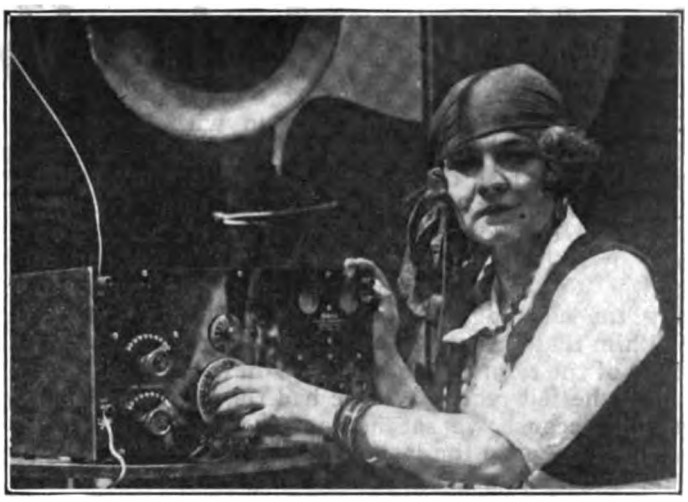
Waves—We the Pictures!

By Robert L. Dougherty

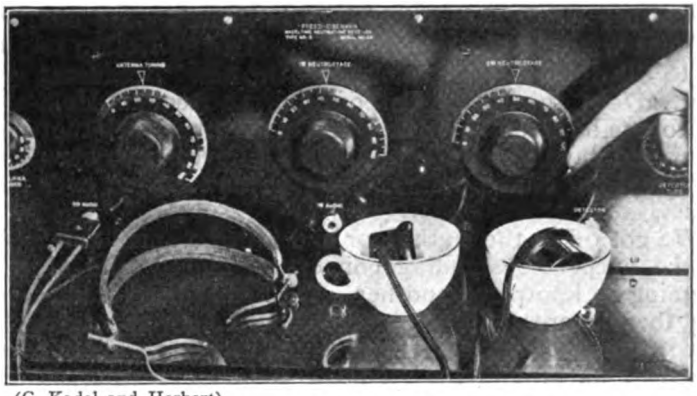
...versation was carried on while the ship was 1,000 miles at sea with ...ation at Schenectady, N. Y. This is the first time that simultaneous ... at sea and people located on land, and marks an epoch in the radio ... directly behind the operator, while the duplex receiver is on the ... receiver and transmitter are centralized and are in front of ... operator.

...thusiasts, meet Arthur ... York City, the super- ... Radio District. This ... absolute "monarch of ... it is to him that we of ... are obliged for the ... of all our powerful ... the alleviation of the ... bugbear.

(C. Fotograms)
The Rev. Dr. Newell Dwight Hillis, noted author, lecturer and educator, pastor of Plymouth Church of Brooklyn, and a minister well known to all broadcast listeners.



(C. Kadel and Herbert)
Miss Betty Beardsley manipulating the radio at the street fair held on Park Avenue, New York City. This fair was held for the crippled children, and all the "400" officiated.



(C. Kadel and Herbert)
Why bother with loud speakers, when two of mother's tea-cups will serve just as well?

(C. Underwood and Underwood)
Frank Houck, nicknamed by the nurses and doctors "the sunshine of Hahnemann," who for months has been in a plaster cast being treated for curvature of the spine, and recovering still smile and laugh when he listens to the radio.

(C. Underwood and Underwood)
Miss Frieda Hampel, famed concert singer, singing "Home Sweet Home" in commeration of the centenary of the writing of that famous song poem.

Located in a place which because of its surroundings did not permit the proper erection of an antenna, these members of the Radio Association of Greater New York built this 100-foot mast to get the best results out of their sets. The chief operator of the club, R. May, is seated atop the tower.

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Radio and the Woman

By Crystal D. Tector

Last Saturday, F. H. was laid up with his usual spring assortment of sneezes and coughs that he pleasantly calls his "daily dozen," and therefore could not attend the Milk Fund Boxing Exhibition. He was grouchy all day long until about two o'clock. You know how a husband gets when he has "a bad cod in by ead." Well, after numerous friends had dropped in during the morning to sympathize with him and try to tell him that there wouldn't be a "scrap" anyway on account of the rain, and then rushed off in their cars for the fight, he felt real nice. We had the laugh on them after all, because we sat home and heard the entire fight right down to the last blow and Humphries making the announcement, and were cozy and warm when the other folks were hurrying home in the rain, and had to buck the crowds n'everything. Then he cheered up and commented again on the wonders of radio.

* * *

Another thing that put friend husband's nose out of joint was the fact that we received an invitation to go to the dedication ceremonies of the new "Broadcast Central" of the Radio Corporation, at Aeolian Hall. Of course he couldn't go, so I told his brother Jack that he would have to escort me. Well, I never have been in a real big studio before, and I haven't gotten over it yet.

We got off at the sixth floor and found a small quiet crowd of people standing conversing quietly and all seeming to know one another. We hadn't been standing there more than a minute when a man appeared mysteriously at our elbow and asked us if we wouldn't like to look around the studios. Before escorting us through he explained that there were two studios, one called the Jazz studio and the other the Classical studio, but for briefness sake he called them studio A and B.

They didn't go very wrong when they called A the "Jazz" studio. The color effect of the hangings and walls is enough to make anyone want to "raise the dickens with a sax." The walls were finished in light blue and green and all the woodwork in salmon pink, with the hangings and draperies the most vivid colored cretonne that you could imagine. Even the furniture is brightly colored, and how anyone could even sit still in this room is more than I can imagine.

The studio "B" or classical studio is just the antithesis of the Jazz room. It is quietly done in old ivory and brown with dark hangings of maroon and old gold. It was the most quieting and soothing thing in the world, and one was instinctively hushed by the very quietness of it. It is simply marvelous what an interior decorator can do with your feelings with a few artistically placed lights and some wonderful quiet colors. Here the chairs were all deep, roomy, comfy and cushiony, and just the type to rest one.

What impressed me the most was the very "deadness" of both of these places. You actually could think out loud without disturbing yourself. Our guide explained that this was accomplished by special walls, which are of wax treated muslin held away from the real wall, with a dead air space between. It was wonderful.

Then we were taken into the control room and, wonder of wonders, we met OON and OHN, the two announcers that are so familiar to all of us. I just talked to them as though I had known them all my life. Isn't it funny how well acquainted you can become by radio with a person?

After a while, when we had gone upstairs and absorbed a lot of technical explanations that I can't remember, we went down and heard all the dedication speeches.

Then the Radio Corporation very kindly provided the nicest little supper and we were left to wander around and poke and question till we became tired and went home, feeling like we had stepped from a fairy land of delights and never ceasing wonders.

And all this time, Friend Husband was sitting home hearing the speeches, and wondering what kind of a time we were having. Oh dear, some men do have hard luck, don't they?

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR BUSY READERS

A whisper into the microphone of a radio broadcasting station sets up vibrations which encircle the globe 7½ times in one second.

* * *

The Havana, Cuba, opera season was opened recently by the San Carlo Grand Opera Company. The first performance, which was marked with great enthusiasm, was broadcast by the Cuban Telephone Company.

* * *

A katydid, by rubbing its legs over its wings and making the sound familiar to every country boy, sets into vibration a cubic mile of air, weighing 6,000,000 tons. The sound is distinguishable at a distance of half a mile on a quiet night.

* * *

Mother's Day received its just share of space on the crowded program of Crosley Radio Station WLW, Cincinnati. All of the holidays are given special attention and programs are arranged especially to commemorate the days for the radio public.

* * *

Christian C. Holtum, a bass singer in "The Clinging Vine," at the Knickerbocker Theatre, New York City, owes his success to radio. It was his voice heard by radio from Newark that attracted Henry W. Savage, an ardent radio fan. Mr. Savage has given Mr. Holtum a long contract, which stipulates that the singer must devote a certain amount of his time to radio concerts.

Keeping fit by wireless has been added to WSB's service through a series of "setting-up" exercises conducted on the Atlanta Journal's 10:45 broadcast. I. C. Matheny, physical director of the Atlanta Y. M. C. A., designed and conducts the course of six simple drills every Tuesday, Thursday and Saturday night at 11 o'clock. Music sets the tempo for the calisthenics, which occupy but a five-minute session.

* * *

The anniversary of the first church service broadcast south of the Mason-Dixon line was celebrated recently by the First Presbyterian Church, Atlanta, Ga. A year ago, the Atlanta Journal station, WSB, installed the requisite relay apparatus and morning worship via radio has been a regular Sabbath feature ever since. The anniversary service included a special sermon by the pastor, Rev. J. Sprole Lyons, on "The Voice in the Air."

* * *

One of the largest railway electrification projects yet undertaken is involved in the contract just closed by the Westinghouse Electric & Manufacturing Company with the Virginian Railway Company. It calls for the electrification of 213 miles of track between Roanoke, Va., and Mullens, W Va., and includes an order for electric locomotives, power house, transformer stations, and other necessary apparatus. The division to be electrified crosses the Alleghany Mountains. The contract, which is the largest of its kind ever consummated, involves the expenditure of $15,000,000.

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Play These DX Nite Owl Records on Your Radio

Anothera Slam at Mike Podhorn—WOW—44 States!

From Bart Geib, Shreve, Ohio

WAS just looking over RADIO WORLD and noticed some of the slams at Mike Podhorn. Although I did not get the issue containing his letter I think, after he sees my record, he will "seek the cause within himself."

I would like to know what type and kind of apparatus he is using. Well, here goes for my record:

Alabama—WMAV, WHAN, WSY, 5XR; Arizona—KDZA; Arkansas—WOK; California—KHJ, 6XA, 6ZK, KWH, KFI, KWG; Canada—CFCA, CFCF, CFAC, CJCG, CJCD; Colorado—KFAF, 9XAQ, 9ZAF, KLZ; Connecticut—1ZKA; District of Columbia—NOF, WCAS, WMW; Florida—WDAE, WDAL, WIAZ; Georgia—WSB, WGM, WDAJ; Illinois—WMAQ, KYW, WDAP, 9XU, WOAG, WAAF, 9ZK, 9ZM; Indiana—WOZ, WLK, WOH; Iowa—WGF, WOC, WLAS, WEAB, WOI, WEAZ; Kansas—WEAD, WBL, WAAP; Kentucky—WHAS, WIAR; Maine—WLAN; Maryland—WEAR; Massachusetts—WGI, WMAF, 1XA, 1XJ, WBZ, WNAC, 1XAE; Michigan—WCX, WWJ, WWI, KOP, WHW, 8XF, 8XAE; Minnesota—WLAG, WJAP, WAAL, WMAF, WCAS; Missouri—WHB, WDAF, KSD, WOS, WCK, WAAN, WOAL; Nebraska—WAAW, WIAK, WFAV, WCAJ; New Jersey—WOR, WJZ, WAAM, WBAF; New Mexico—KOB, 5YQ; New York—WGY, WGR, 2XI, WRW, WHAZ, WEAF, WHAM, WMAC, 2XB, 2XY, WBAY, 2ZK, 2XL, WHN; North Carolina—WBL; Ohio—WJAX, WHK, 8YD, WBAV, WOC, WWB, AN4, WLW, WMH, WAAY, WFO, AQ6, WPAL, WBAJ, 8YAE, WPL, WEAH, WRK, WJAK, 8XR, WOAC, WMC, WMAN, WJD, 8ZO, WQAF; Oklahoma—WKY, WLAL, 5XZ, WPAC; Oregon—7XI; Pennsylvania—KDKA, WCAE, WIP, WBAK, KQV, WQAA, WGL, 3CDP, WFI, 8ZAE, WNAL; Porto Rico—WKAQ, WGAD, 4OI; South Dakota—WCAF; Tennessee—WKN, WPO, WNAV, WAC; Texas—WPA, WBAP, WFAA, WJAD, 5XAD, WOAI, WCM, WSAV; Utah—KZN, KDYL; Vermont—WCAX; Virginia—NAA; Washington—KNF, KQT, KFZ; West Virginia—WAAO; Wisconsin—WIAO, WCAY, 9XM, WHA, WAAK; Cuba—PWX; Louisiana—5YR; Wyoming—KFBF. Steamships—KKW, WCL, WGN.

That's a record to be proud of, I think. I am using Clapp-Eastham H. R., with H. Z. amplifier and Magnavox. I am an ardent radio-golf fan since it started I've started a list like the following three or four entries: WHAS—Alamo Theatre Orchestra; WDAP—Jack Chapman's Orchestra; WJZ—Vincent Lopez's Orchestra.

Let's see who can get the biggest list like that. Don't list the same orchestra twice, but you can list the station twice, with a different orchestra, church, pipe organ, chimes, instrumental trio, quartette, etc.

I've got 58, and will send in my list as soon as I get 75.

Well, I think my record will make even Mr. Lindstrom sit up and take notice. I've got the date and acknowledgment of signals heard from most of these stations.

* * *

The U. S. at Your Finger Ends

From Paul Richardson, 406 Baltimore Bldg., Oklahoma City, Okla.

I BUY the RADIO WORLD each week and enjoy it very much, for the reading is fine. I have a single set circuit that I have made and have heard from coast to coast and from Winnipeg, Canada. South to Houston, Texas. Here are a few stations that I have heard: KSD, WGM, WSB, KYW, WDAP, WAAD, WLW, WFAA, WOC, KLZ, KOP, WWJ, WCX, WBAP, WEV, WLW, WDAF, WHB, WGAT, WHAS, KHJ, WGI, WHAD, WAAB, WBAY, WGY, WOAI, KZN, WMAF, WEB, CHCF, WOAE, WSY, WHA, WLAG, WMY, RFAF. My antenna is 40 feet high, 75 feet long, ground runs five feet to water pipe.

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

* * *

From Smith to Smith—Oh, Smith!

From A. L. Smith, 676 Euclid Ave., Beaumont, Texas

IT seems that everybody is taking a crack at Kenneth Smith, of Birmingham, Ala., so I will take one just to be in style.

My set is a single-tube set (WD-11 tube), using a 43-plate condenser, variocoupler and grid leak. Some of the stations I have heard are as follows: KHJ, KWH, KFI, Los Angeles, Cal.; KPO, KUO, San Francisco, Cal.; WLAG, WLB, Minneapolis, Minn.; WCX, WWJ, Detroit, Mich.; WWI, Dearborn, Mich.; WGY, Schenectady, N. Y.; WOC, Davenport, Ia.; KDKA, Pittsburgh, Pa.; WJAZ, WDAP, KYW, Chicago, Ill.; KGO, Altadena, Cal.; PWX, Havana, Cuba; WSB, WGM, Atlanta, Ga.; WOI, Ames, Ia.; WHA, Madison, Wis.; KDZU, KFAF, WFEL, KLZ, Denver, Colo.; WJZ, Newark, N. J.; WGF, Des Moines, Ia.; WHB, WDAF, WOQ, WMAJ, Kansas City, Mo.; WLW, Cincinnati, O.; WOS, Jefferson City, Mo.

I have received as many as 28 stations in one night. To date I have received 79 stations. Who can beat this with one peanut tube? Let's hear from you DX Nite Owls!

* * *

A Nice Month's Work

From Osborne Huckley, 2436 W. 33rd Street, Denver, Colo.

I AM sending you my record for one month's reception:

KDKA, Pittsburgh; KDYL, Salt Lake City; KDYS, Great Falls; KDZQ, Denver; KFAB, Portland; KFAD, Phoenix; KFAE, Pullman, Wash.; KFAF, Denver; KFBK, Sacramento; KFCI, Los Angeles; KFDF, Casper; KFEL Denver; KFEP, Denver; KFFQ, Colorado Springs; KFZ, Spokane; KFI, Los Angeles; KGW, Portland; KHD, Colorado Springs; KHJ, Los Angeles; KUS, Los Angeles; KLN, Del Monte, Cal.; KLZ, Denver; KPO, San Francisco; KYW, Chicago; KZM, Oakland; KZN, Salt Lake City; WAAH, St. Paul; WAAL, Minneapolis; WAAP, Wichita, Kansas; WBAP, Worth; WRAD, Marion, Kansas; WRR, WCAS, Minneapolis; WDAF, Kansas City; WDAO, Dallas; WDAP, Chicago; WEAH, Wichita, WEAY, Houston; WFAA, Dallas; WGM, Atlanta; WHAS, Louisville; WHA, Madison, Wis.; WHB, Kansas City; WIP, Philadelphia; WUAP, Duluth; WLAG, Minneapolis; WLAU, Waco, Tex.; WLAZ, Warren, Okla.; WLK, Indianapolis; WLW, Cincinnati; WMAU, Kansas City; WMAQ, Chicago; WMC, Memphis; WOAI, San Antonio; WOC, Davenport; WOO, Philadelphia; WOS, Jefferson City; WPA, Fort Worth; WRAD, Marion, Kansas; WRR, Dallas; WSB, Atlanta; WWU, Detroit; CFCN, Calgary, Can.; CHBC, Calgary, Can.; CKCK, Regina, Sask., Can.; CFAC, Calgary, Can; AA-3, Denver.

I am using a radiotron WD-11 (peanut) tube and get best result with a "B" battery of 18 volts. My aerial is one wire 40 feet high and 100 feet long. Any further information concerning this set will be furnished on receipt of stamp.

(C. Photonews)

Brooklyn to the fore! William Delaney in order to hold up the record for Brooklyn and show them that they can do it in that man's town as well as any other, made a DX record of receiving 40 stations in one evening. The receiver is entirely home made. As a starter, he charted a station 1000 miles away and then worked around, stretching his legs at every step. Canada, Cuba, Texas, Nebraska and all the intervening territory was covered on detector and two stages of audio-frequency. How's zat?

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Answers to Readers of Radio World

Where can I obtain a complete hook-up of the circuit shown by C. White in RADIO WORLD *for March 3, on page 11? What voltage is necessary to obtain good results with this circuit?—Henry M. Schwab, 201 Buell Street, Muscatine, Iowa.*

The circuit was shown complete in the issue you mention. As previously stated we do not furnish blue prints. 1½ volts for the A battery and 22½ volts for the B will be sufficient.

* * *

In RADIO WORLD *for May 20, 1922, you published a diagram of a three circuit regenerative set. Will you kindly advise me where I can obtain a diagram for an additional two stages of amplificaiton? What is the grid condenser and leak capacity in the diagram?—James B. Thompson, Toronto Water Works, Toronto, Canada.*

If you will refer to page 26 of RADIO WORLD for March 31, you will find the diagram you desire. The grid leak in the diagram can be omitted, as it is not necessary with the circuit you mention. In the original diagram the condenser and grid leak should be .0025 mfd. and 1-2 megohms. If you intend using the 1½ volt tubes would advise using a variable grid leak, as these tubes are somewhat critical as to leak resistance, and better results can ofttimes be had by the use of a slightly different capacity of leak.

* * *

In RADIO WORLD *for March 24 there appeared an article by C. White on combining radio-frequency and regeneration, and mention is made of using a condenser of .25 mfd. capacity. Can these be purchased, or do they have to be made? If I have to make them kindly give me the directions.—H. E. Worldon, 1205 Pacific Ave., Peoria, Ill.*

If you will refer to page 8 of RADIO WORLD for April 14 you will find the information you desire as to the construction of large size telephone condensers. The article is by C. White and fully describes the method of determining the capacity of a condenser and how to build it up to any desired capacity.

* * *

Kindly refer me to a back issue containing a hook-up for the following apparatus: coupler, 43 plate vernier condenser, vernier, rheostat, grid leak, tube and all other necessary articles to make a one tube regenerative circuit.—A. A. Willaugham, 190 Major St., Toronto, Canada.

We refer you to any one of the following back issues in which you will find the hook-up you desire: RADIO WORLD, January 27, page 4; February 24, page 20; March 23, page 9 and page 13; March 10, page 20. Take your pick of any of these. They are all good circuits.

* * *

I HAVE constructed the Reinartz tuner hook-up as enclosed without using either the exterior coil or the amplifier, but cannot get anything except local stations, and even those are very weak. Can you suggest any way of alleviating my trouble? —O. C. Houser, McClure, Ohio.

The tube you mention is not exceptionally efficient in this circuit. Would suggest that you use the U. V.-200 as detector, or U. V.-201A. Use the regular Reinartz coils as inductance. Circuit diagram and full directions for the winding of these coils were given on page 23 of RADIO WORLD for January 13, 1923.

* * *

In RADIO WORLD *for April 21 you published an article by Mr. Turner on using the two-unit tube in connection with a receiver. When he states that he used the "other circuit," does he mean the one without the variable potentiometer in the circuit? Can I replace the coil with a variometer, and will a variable condenser increase the volume of signals in the receiver? Will 22½ volts in the plate circuit be sufficient? How should the circuit be tuned? Will the variometer mentioned work better than the tapped coil that is supposed to be used?—Ellwood F. Jahn, 5526 Catherine Street, West Philadelphia, Pa.*

When he states the "other circuit" he means the one without the potentiometer. Yes, you can replace the coil with the variometer. This will increase your selectivity to a great extent and give you much finer control of your tuning. The condenser will not increase the volume of your signals but will simply tend to make your set more selective and enable you to get much finer tuning. If you intend to use a variometer, would suggest that you place a tapped coil in series with it, to enable you to tune to the higher wave lengths when necessary. A coil 3½ inches in diameter and 6 inches long, wound with No. 22 SSC wire for five inches of its length and tapped at every 20 turns will suffice for this, unless you care to utilize honeycomb coils, which are much more efficient. The condenser you mention (11 plate) will be perfectly correct. 22½ volts B battery will be sufficient for one tube, but you will probably have more volume if you place 45 volts on the plate. In tuning this circuit you should throw your condenser to full capacity (100) and swing the variometer around until you hear signals. If you hear two stations on together, bring your condenser down and repeat the operation until your stations are separated and you are only hearing one at a time. If you are using the potentiometer, then bring the potentiometer into play until the signals have cleared up and the volume is the strongest with the least amount of distortion. The variometer will simplify your controls and make tuning easier.

* * *

In RADIO WORLD *for April 7, 1923, you published an article by Rumford in connection with "An All Wave Universal Receiver." Can I use a panel 9x12x¼ instead of the 7x14 specified? He states that the directions must be carried out specifically.—Michael Teaschner, 831 Van Duzen Street, Stapleton, Staten Island, N. Y.*

You may use any size, shape, or kind of a panel you wish. It makes no difference what size panel you use in the construction of a set, as long as the wiring is O. K.

* * *

Where may I find a circuit diagram for the following apparatus: Variocoupler, variable condenser, WD-11 tube, batteries, phones, and all other necessary apparatus to make a single circuit receiver. Are these tubes as good detectors as the ordinary six-volt storage battery tube? Where can the tubes be obtained?—R. D. Thornton, 1906 County Street, Portsmouth, Va.

We refer you to RADIO WORLD for April 21, page 21, column 2 (DX page) where you will find the circuit you desire. The WD-11 are classed as excellent detectors, and are extremely efficient and economical. When compared with tubes such as the U. V. 200 or 201 A, or the other six-volt tubes, the only difference is a slight decrease in the volume. They can be obtained in any up-to-date radio shop.

I have constructed a receiver, put up an outside antenna, and have been told by a neighbor that I must take down my wire because it crosses one corner of his garage. It is not attached to his property, and is 25 feet above his roof. He threatens to prosecute me, saying that I am disobeying the fire laws. The other end is anchored to a corner of a building, and I have full permission of the other to leave my antenna there. Can my neighbor make me remove my wire?—A constant RADIO WORLD *reader, Los Angeles, Cal.*

You are guilty of trespass and can be made to remove your wire. You are not disobeying the fire laws, but you are trespassing on another man's property. You will have to run your wire in such a manner that you do not cross his property, unless you get full permission from him, or anybody over whose property you pass.

* * *

I have recently tried out the new 201 A tube in connection with my receiver, and find that I cannot get as good results with it in connection with my detector as I do with my U. V. 200 tubes. I find that it is a much better amplifier than a detector.—D. R. Kilgore, Okemah, Oklahoma.

This tube is used as both detector and amplifier, but works much better as amplifier than as detector. It will work well as detector, but the ideal combination is to use it as amplifier with the regular U. V. 200 as detector. You will be able to obtain much better results in any circuit employing regeneration if you use variable grid leaks.

* * *

I have built the Sorenson circuit described by Ortherus Gordon in your issue of Jan. 20, and have had wonderful results with it, but fear that I will have to junk it after May 15. Can this be fixed so that I can retain the circuit and set? Using the coils mentioned and a .001 variable condenser I can just reach 485. How can I get the higher waves that are going to be assigned?—W. H. McKee, Wynn, Ark.

You can very easily overcome the trouble that you anticipate by substituting larger coils, preferably No. 100 and 75 DL or honeycomb coils. This will enable you to reach to all the wave lengths that will be assigned under the new regulations. You can very easily do this by simply connecting the new coils in the circuit.

* * *

I note that there is a new law going into effect to stop amateurs working their sets between the hours of 7:30 and 10:30 P. M. Does this mean that we will not be able to use our receivers between these hours or does it only affect the amateurs that hold Government licenses?—Henry Herbert, 569 West Street, Hoboken, N. J.

The new regulation means that amateurs owning transmitters will not be able to use them between those hours. This is to eliminate any interference between the broadcasters and the amateurs. It means that the broadcasters will have clear air between those hours.

Radio Left No Record

Barrister: But couldn't you let me have some of his love letters?

Breach of Promise Client: There weren't any. We had wireless sets.—*London Answers.*

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You Simply Cannot Keep Up to the Latest Radio Developments Unless You Read Radio World—Here's Proof

THE following text and news pictorial features appeared first in RADIO WORLD—in some cases six weeks ahead of every other radio publication:

Second Annual Radio Show, April 1, 1922.

E. H. Armstrong's Super-Regenerative, a device for amplifying signals 100,000 times, June 4, 1922.

First Radio Photograph, June 4, 1922.

The Armstrong Principle of Super-Regeneration Fully Explained, July 1, 1922.

A Wonderful Hook-up Utilizing Major Armstrong's Invention in a New Manner, August 19, 1922.

The Super-Heterodyne Principle Applied to the Armstrong Super-Regenerative Circuit, October 7, 1922.

Wired Wireless Insures Secrecy in the Sending and Receiving of Messages, February 3, 1923.

Leroy Satterlee's New Amplifying Circuit, February 3, 1923.

Hook-up for Building Your Own Power Amplifier, February 24, 1923.

Hazeltine's Neutrodyne Receiver, March 10, 1923.

High Lights on the Third Annual Convention of the Second District, March 17, 1923.

Newark Apartment Building Gives First Complete Radio Service to Tenants, March 31, 1923.

The Hazeltine Neutrodyne Receiver Explained, March 31, 1923.

And others—as our files will show.

Read RADIO WORLD and get the news and developments in radio FIRST.

Audio-Frequency Amplifier Unit for Simple Radio Receiving Set

VERY simple radio receiving outfits are described in a series of circulars issued by the Bureau of Standards of the Department of Commerce, and published at the request of the States Relation Service of the Department of Agriculture. The circulars are fully illustrated.

The first two, which are Bureau of Standards Circulars Nos. 120 and 121, describe receiving sets using crystal detectors. Circular 120 describes the receiving antenna and ground connection also. Circular No. 133 describes an electron tube detector unit which can be substituted for the crystal detector in either of the two sets previously described. Circular No. 137 describes telephone shunt and series antenna condensers and a loading coil for use with the simple receiving sets.

The fifth circular of this series is No. 141. It describes an audio frequency amplifier unit of such proportions that in external appearance it matches the electron tube detector unit. One or two of these amplifier units may be used with the equipment previously described to amplify the signals detected by the electron tube detector unit, or the detector unit may be omitted and one or two amplifier units used with the crystal detector. In either case the addition of the amplifier units results in a considerable increase of the volume of the received signal and increases the receiving range somewhat.

Copies of these circulars may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price of Circular 141 is ten cents. The others are five cents.

How Religious Services Are Broadcast *By C. H. Huntley*

HAVE you ever wondered how a radio broadcasting station with its fixed equipment manages to send out religious services weekly from churches many miles away from the sending station?

The operating staff of WGY, the Schenectady, N. Y., station of the General Electric Company, has so developed church service broadcasting that thousands of letters of appreciation are sent in from far and near. Furthermore, clergymen who were frankly skeptical at first of the value of broadcast religious services and who doubted that the dignity and beauty of these services could be conveyed through the air, now pronounce radio an invaluable aid.

The installation necessary for broadcasting the services of the Second Presbyterian Church, Amsterdam, N. Y., on a recent Sunday, is typical and will give the radio fan an idea of how it is accomplished.

In the church were four microphones, two of them spares for emergency use. One microphone and a spare were placed at the reading desk to get the words of the clergyman in scripture reading, prayer, sermon and announcements and a microphone and spare were hung above and in front of the choir and organ. These microphones or pick-ups were the only evidence to the congregation that the service it was hearing was going out to countless thousands many miles away. There is nothing in the church installation to distract the attention of the congregation from the service.

At one side of the church, hidden from view but in a position where he could follow the service, was stationed one of the WGY staff who switched the microphones on and off as the service progressed. If the minister was speaking his microphone was brought into the circuit and the choir microphone was switched off.

Two other operators were situated in an adjoining room where a portable control equipment had been installed. In this room one of the operators controlled the amplification of speech and music. The amplifying outfit consisted of two five-watt tubes, one 50-watt tube and other necessary apparatus. Sufficient amplification was used to overcome line noise on the 20 miles of telephone wire necessary to carry the electrical oscillations set up in the microphone to the control room of WGY in Schenectady, N. Y. The second operator in the side room was in constant communication by special land wire with the control room at WGY.

In the control room in Schenectady the church services were again amplified, this time on equipment which consisted of one five-watt tube and two 50-watt tubes. From this point the electrical oscillations passed to the power apparatus and were impressed on the modulator and oscillator tube going thence to the antenna and the air.

Between church and control apparatus the church service passed through three exchanges of the New York Telephone Company—the Amsterdam exchange, the Schenectady exchange and finally the exchange of the General Electric Company.

MAGNAVOX
Radio Products

R2 Magnavox Radio *The* Reproducer Supreme

The Utmost in Sound Amplification

Where the reproduction of broadcasted programs is desired in large volume, the Magnavox Reproducer R2 should be used.

Thanks to the Magnavox (electro-dynamic) principle of construction, this result is secured with minimum electrical energy.

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . **$90.00**

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field **$60.00**

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . **$35.00**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

Magnavox Radio products can be had of good dealers everywhere. Write for copy of our new booklet.

The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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"When you come right down to it a profitable business is principally dependent upon two things—a salable article of quality, and advertising."—William Wrigley, Jr.

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

O. H. Kloss, 2504 N. Alder Street, Philadelphia, Pa.
George H. Brown, 9 Bowdoin Street, Dorchester, Mass. (Retailer.)
Sherman Diefenbacher, R. F. D. 14, Box 99-A, Mt. Healthy, Ohio.
Horne Drug Co., P. O. Box 276, Jonesboro, Ind.
George Scharmer, 110A Yale Avenue, Jersey City, N. J.
J. Brezcale, 1404 Main Street, Fort Worth, Texas.
Howard C. Denny, 803 Fifth Avenue, Coraopolis, Pa.
South Side Electric Shop, W. L. Miller, 231 East Smith Street, Herkimer, N. Y.
Harry J. Durborow, 4933 Chancellor Street, Philadelphia, Pa. (Interested in loud-speakers and loud-speaker units to be installed in special resonators.)
L. B. Mohr, 3417 Lexington Street, Chicago, Ill.
Harry E. Watson, 642 East Thayer Street. Philadelphia, Pa.
Clyde Case, 1223 East 57th Street, Chicago, Ill.
Colonel G. E. Barnhardt, U. S. A., The Marlborough, 917 18th Street, N. W., Washington, D. C.
Merlin Haag, 303 South Prairie Street, Whitewater, Wis.
R. Sullivan, 247 East 58th Street, New York City.
Guy W. Hooper, Box 733, Marlow, Okla. (Wants dealers' prices.)
Berry's Radio Shop, Y. M. C. A. Bldg., Waterville, Me. (Retailer.)
R. Bublitz, Winthrop, Minn.
Wilber I. Bissonette, Mahtomedi, Minn.
Raymond A. Riedner, P. O. Box 177, Republic, Wash. (Retail radio supplies and service.)
A. T. Hagenkamp, 2911 Sixteenth Street, San Francisco, Cal.
Julius Dietrich, 1004 South Main Street, Bloomington, Ill.
J. Leifson, 810 Seventh Avenue, Seattle, Wash.
Joseph Lonergan, Ellendale, Minn.
Midland Electric Mfg. Co., Indianapolis, Ind.
Harold C. Canfield, 384 Jefferson Avenue, Rochester, N. Y.
Robert Gray, Union Bridge, Md.
The McWalters Agency, P. O. Box 131, Hoboken, N. J.
V. Brown, Edgerton, Wis.
Jos. Trainor, Box 94, Station B. Brooklyn, N. Y.
George F. Pyne, 51 School Street, Milford, Mass. (Dealer.)
J. H. Hensberger, Box 51, Yukon, Pa. (Electrical supplies.)
Chas. H. Brumfield, Box 162, Forrest City, Ark.
Joe W. Warren, 1325 Main Street, Cherokee, S. C. (Dealer. Wants wholesale prices.)
Bert Carroll, 109 Duboce Avenue, San Francisco, Cal.
C. B. Tucker, 21 Summer Street, Marblehead, Mass.
A. M. Connett, 564 Washington Street, Boston, Mass. (Manufacturers' representative. Wants radio line.)
Edwin F. Windham, 215 Somerset Street, North Plainfield, N. J. (Wants wholesale and retail prices.)
Chas. L. Furry, Alden, Ia. (Retailer.)
Joseph R. White, Radio Hill, Holmes, N. Y.
William R. Harvey, 800 Altgeld Street, Chicago, Ill.
H. Johnson, 150 Wilkins Avenue, Portchester, N. Y.
W. Edward Treahy, Box 121, Manville, N. Y.
Alyn H. Jones, 81 Vaughan Road, Toronto, Canada.
Henry Ives Cobb III, Groton School, Groton, Mass.
A. L. Boyce, West Oneonta, N. Y. (Distributor.)
James Colas, 75 East Main Street, Salem, Ohio. (Wants dealers' prices.)
Wm. D. Huber, 716 Woods Run Avenue, North Side, Pittsburgh, Pa.
N. Wesley Grubb, 460 Highland Street, Mannington, W. Va.
T. H. Cole, P. O. Box 256, Millerton, N. Y.
William E. Baumann, 1260 24th Street, Milwaukee, Wis.
Howard N. Mower, 1703 Summerfield Street, Ridgewood, Long Island.
Wigo Nymon, Box 398, Fargo, N. D.

Can't Copy This Circuit

A NEW receiver which has a remarkable circuit that cannot be imitated has been perfected by the Atlantic & Pacific Radio Company, New York City. This receiver is so constructed that if taken apart the circuit is entirely destroyed. This makes the new circuit incapable of being copied, as its method of construction does not permit it.

The receiver is very selective and sensitive, having a range of 1,000 miles using one of the dry cell tubes. All connections are plainly marked and ample binding posts conveniently located are provided.

(C. Photonews)

A new uni-control receiver which cannot be examined or taken apart without destroying the circuit.

It is a single control set and operates with extreme clearness and sharpness of tuning. The entire set, with the exception of the batteries, encompasses a space of only 2x6x8 inches.

Variation to the Nth Degree

A NEW grid leak recently brought out by the Arthur Pudlin Engineering Company, 1540 Broadway, New York City, has several merits that would pay the up-to-date builder to investigate if he wants fine variation in grid leaks. The apparatus is a small bakelite tube with metallic ends, facilitating mounting in the various types of condensers that are made for use without combining grid leaks. Inside this tube is a special composition. A small wire with a handle projecting from one of the ends enables the user to obtain infinite variations and, as this is what is really needed, it should meet with a great demand by radio users and builders. It is either furnished complete with a grid condenser and mount, or by itself.

Radio Stocks

(Quotations as of May 16, 1923, furnished by Frank T. Stanton & Co., 15 Broad St., New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
American Marconi, Stamped..	5*	20*
American Marconi, Unstamped	$5	$7
American Tel. & Tel.....	121½	122
Canadian Marconi	2	2½
De Forest Radio.....	8	10
Dubilier Condenser	10	10⅛
English Marconi com.....	10	15
English Marconi pfd.....	10½	16
Federal Tel. Co., Cal.....	4	5
General Electric	175½	176
Hennessy Radio Pub. 8% pfd.	10	12½
Mackay Companies com.....	112	115
Marconi Int. Marine.....	8	10
Manhattan Elec. Supply.....	50¼	51
Radio Corporation com.....	3½	3⅝
Radio Corporation pfd.....	3½	3⅝
Spanish Marconi	1	3
Western Union	107	108
Westinghouse E. & M.....	54½	54¾

*Cents per share.

Series Parallel Switch for Panel Mount

THE Marvel Switch Company, 28 West 25th Street, New York City, have recently put on the market a new type of series-parallel switch which is small and unique in construction. Inasmuch as it is small and is meant for panel mount, it should furnish the builders of sets with an easy solution of series-parallel condenser connections. The entire switch is very little larger than the conventional knob. There are three positions marked on the switch, with a marker and stop for each position. The series and parallel positions are made by means of two double arms on four points, and a comprehensive drawing comes with each switch, enabling the user to make the connections easily and quickly. By drilling a few holes, for which the plate of the switch can be used as a template, the switch can neatly be mounted on the panel.

New Radio and Electric Firms

Park Auto and Radio Supply Corp., New York City, $5,000; I. Teitelbaum, B. and J. Bluestein. (Attorney, B. Indigo, 299 Broadway.)

Selko Electric Co., Brooklyn, N. Y., $10,000; J. Selikowitz, E. L. Braverman, S. H. Feinson. (Attorney, J. Feinson, 299 Broadway.)

Experimenter Publishing Co., New York City has increased its capital stock from $15,000 to $250,000.

Jenick Electric Co., New York City, general contracting. $5,000; A. and E. Jenick, P. Arnold. (Attorney, M. Remson, 342 Madison avenue.)

Far-Wes-Ton Electric Co., Jamestown, N. Y., $25,000; L. D. Norton, W. C. Westerman, C. E. Farren. (Attorney, H. R. Lewsi, Jamestown.)

Whiteland Radio Co., Brooklyn, N. Y., $50,000; J. L. Spence, J. Hoyt.

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New List of Boys' and Girls' Summer Camps

FOLLOWING is a list of names and addresses of directors of boys' and girls' summer camps, each of whom should be a potential purchaser of radio sets for camp and vacation use. Additions to the list will be published in succeeding issues of RADIO WORLD:

Miss Gertrude Wood, Box 416, Maplewood, N. J.
Miss Corinne B. Arnold, 1419 Master St., Philadelphia, Pa.
G. L. Meylan, M.D., Columbia University, New York.
Miss L. Juliette Meylan, 468 West 141st St., New York.
G. L. Meylan, A.M., M.D., Columbia University, New York.
Arnold M. Lehman, 311 West 94th St., New York.
Abraham Mandelstam, 230 West 107th St., New York.
Sumner R. Hooper, Rockwood, Me.
Frederick L. Guggenheimer, 36 West 68th St., New York.
Hubert, L. Rand, 21 Heminway Rd., Salem, Mass.
P. H. & R. H. Cobb, Denmark, Me.
Frederick H. Wilson, M.D., Kingsley School, Essex Falls, N. J.
Frank D. Smith, 353 East 163d St., New York.
H. W. Gibson, 167 Tremont St., Boston, Mass.
Mrs. Sarah B. Hayes, Ashland, Mass.
Ralph C. Hill, Utica (N. Y.) Country Day School
Walter Overton, Camp Bob White, Ashland, Mass.
Mrs. Dwight L. Rogers, 8 Parkside Rd., Providence, R. I.
Dwight L. Rogers, Jr., Mountain Ave., Westfield, N. J.
Miss Lillian Millhauser, 220 West 110th St., New York.
Arthur W. Millhauser, 52 Broadway, New York.
Catherine E. Morrison, Ward-Belmont, Nashville, Tenn.
Emma I. Sisson, Ward-Belmont, Nashville, Tenn.
Mrs. Morris Stark, 925 West End Ave., New York.
James E. Harvey, 1807 Riggs Pl., N. E., Washington, D. C.
M. A. Harvey, 1807 Riggs Pl., N. E., Washington, D. C.
Miss Lucile R. Ryttenberg, 5 West 65th St., New York.
Eugene H. Lehman, Highland Manor, Tarrytown, N. Y.
Mrs. Madaleine D. Lehman, Highland Manor, Tarrytown, N. Y.
Miss Estelle B. Davidsburg, Highland Manor, Tarrytown, N. Y.
Helen C. Culin, Ogontz, Pa.
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(*To be continued*)

Radio Limericks

(*Silly little things we call 'em, but they amuse a light-hearted world. Send us your limerick, with name and address.*)

There was a housemaid of Elmira,
And naught in the U. S. would tire her.
'Til a radio set caught her fast in its net—
And she loafed 'til the folks had to fire her.
—F. P. Marsden, Madison, Wis.

I am a young fellow of Philly,
Who, although you may say I am silly,
Can build an antenna, and work it, and then a
Cop brings it down with his billy.
—James B. Skoon, Philadelphia, Pa.

There was a smart girl of Canarsie,
Bought a radio set to let pa see.
She got lost in the ether above and beneath her,
And father said: "Don't go too far—see!'
—Jack S. Palmer, Portland, Me.

"And the Mules Came Back"

WHILE in Atlanta, Ga., recently on a radio inspection trip Commissioner Carson, of the Department of Commerce. was advised that his best team of mules had disappeared from his farm in a nearby state, and, being later in the broadcasting station of a local paper, he let their loss be broadcast with a description. A few days afterwards when in Nashville, Tenn., he was advised that his mules had been found wandering miles from home. Whether radio was responsible for their discovery or not cannot be proved, the commissioner says, but he believes it was instrumental in their release from temporary confinement. "I was glad to get them back," he added. "They were good mules."

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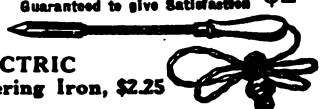

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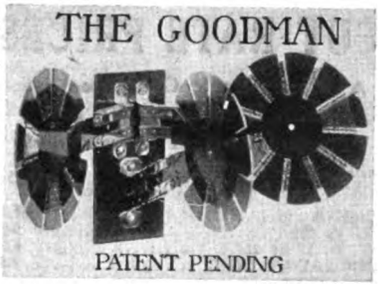

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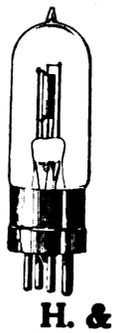

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Summer Park Concerts to Be Broadcast

ALTHOUGH the broadcasting of the government's band concerts by NAA, Arlington, will cease during the summer months, radio fans within several hundred miles of Washington, D. C., will be able to pick up some concerts if the plans of the Chesapeake and Potomac Telephone Company are carried out.

By June 15 this company hopes to complete its new station in Washington and start broadcasting the open-air public concerts from the White Lot and local parks, where the marine, navy and army bands will play almost daily.

Through the aid of a new portable "input apparatus," recently perfected by the telephone engineers, the C. & P. company expects to furnish the added "juice" necessary to pick up concerts and transmit them by wire to their station for radio broadcasting. This apparatus is mounted on a motor truck, and can be dispatched anywhere in the city where something is to be broadcast.

Representatives of the company say that it is also sometimes difficult to relay speeches and music from private residences via telephone lines to broadcasting stations, due to lack of current, but with the new "booster" they expect to overcome this handicap.

Important speeches and some concerts will also be put on a land line to New York and broadcast simultaneously from WEAF on a different wave length.

Most of us still prefer the telegraph. They don't send bedtime stories over that.—*Wall Street Journal.*

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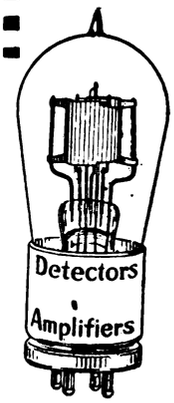

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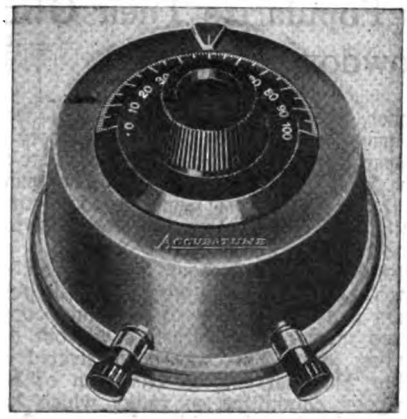

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The Rand McNally Radio Map of United States is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

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THE COLUMBIA PRINT
1493 BROADWAY NEW YORK CITY

THE ANNIVERSARY NUMBER of Radio World was increased in size and is an exceptional issue. A few copies left at 15c. each, or you may start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

WOR Opens Its New Studio

AT eight o'clock on the evening of May 10 L. Bamberger & Company's radio broadcasting station, WOR, at Newark, N. J., was officially opened for use. The new studio is located on the main floor at the Bank street entrance of their store.

Instead of the common practice of having just one large studio this station now has two. One is a room forty feet long and thirty feet wide, hung with heavy gray draperies and furnished with heavy rugs.

In this studio will be accommodated all the large bands, dance orchestras, singers—in fact, every program that requires a spacious place to produce good results.

Adjoining this main studio is another one, much smaller, which is to be used in broadcasting speeches and programs not necessitating the use of the larger room. It is furnished in the same manner as the other, but is deadened even more than the larger one. Across the hall is the reception room, where the artists and guests can gather before the program.

This station has accomplished some wonderful work in the past; but, with the aid of the newer and larger quarters and increased facilities, everything will be easier to handle, and, therefore, better results will be produced.

The Future of Radio Visualized

C. FRANCIS JENKINS, of Washington, D. C., delivered an address on "Radio Photography, Movies and Vision," before the annual convention of the Society of Motion Picture Engineers last week at Atlantic City, N. J.

"No newspaper can possibly put a distant news event before the public as quickly as the theatre can with radio pictures," he said. "It is possible, perhaps probable, that a news bulletin in pictures and type may be broadcast and the photographic negative thereof be used in the printing of the usual news bulletin sheet either by direct photographic process or by a photo-etching process, the etched plate for use in the printing press. This would eliminate the necessity of local typesetting plants.

"The police departments of the various cities of the country would also doubtless be customers for picture distribution service, as photographs of criminals, as well as their thumb prints could be readily distributed. Bankers and business executives could in a few minutes verify signatures to checks, drafts or documents; indeed contracts and other forms of credit could be exchanged across the continent within the hour."

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To the DX Nite Owls

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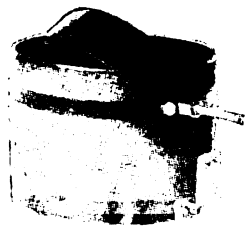

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Music Publishers Give in to Broadcasters

Radio World's Suggestion That Broadcasters Are Able to Popularize Their Own Music Helps to Bring About a Quick Showdown

THE Music Publishers' Association of the United States, following the recent announcement in RADIO WORLD that broadcasters could popularize their own music, has helped to solve the situation satisfactorily. A few days ago, the Music Publishers' Association agreed to permit the broadcasting, without fee, of the music controlled by their members, at least temporarily.

The members of the Association are perfectly well aware of the fact that the broadcasters, following the suggestion of RADIO WORLD and the lead of the Westinghouse Electric and Manufacturing Company in cutting out all copyrighted music from their broadcasting programs, solved the situation, and made it necessary for the Association to come to terms immediately or lose the tremendous advertising possible through broadcasting. At the meeting of broadcasters held recently in Chicago, certain strenuous lines of action were decided upon. This combination of circumstances made the publishers see a strong light.

M. E. Tompkins, of G. Schirmer, Inc., New York, publishers, chairman of the committee, in a statement said: "Our Association, which has been in existence since 1895, represents particularly the so-called 'standard' publishers, which make up a majority of its forty-nine members, as distinct from publishers of popular music, although a number of the latter are also members.

"Our committee has been carefully investigating the broadcasting of copyrighted music since last November. In our report, just adopted by the Association, we point out that music publishers are vitally interested in radio broadcasting as a great future user of music and that our rights in the use of our copyrighted music in public performances must be protected. However, we appreciate the fact that radio broadcasting is still in a chaotic and experimental state and that, while ultimately it will have to be placed on a commercial basis if it is to develop its potentialities, nevertheless the commercial side of the broadcasting problem has not yet been solved.

"In view of these facts and also because we desire to cooperate in developing the music possibilities of radio, we believe that we should allow the use of our copyrighted musical compositions for broadcasting without charge for the present, and without prejudice in our rights."

While the action of the Music Publishers' Association does not bind its members, but merely recommends, it is understood that most of the large standard publishers in its membership will follow the recommendations of the Association. The following representative standard publishers have definitely decided to follow the recommendations: Carl Fischer, G. Schirmer, Inc., C. H. Ditson Company, John Church Company, Boosey & Company, and Hinds, Hayden & Eldredge of New York City; Oliver Ditson Company and B. H. Wood Music Company of Boston; Paul A. Schmitt of Minneapolis and Clayton Summy of Chicago.

The Producing Managers' Association, of New York, has lined up with the music publishers and is in favor of releasing copyrighted music to broadcasters without demanding fees. This was demonstrated by Arthur Hammerstein, as chairman of the managers' committee on radio, which has been looking into the subject for a month.

"We are not at all averse to the broadcasting of our music by radio," he declared. "In fact, we are very much for it. We believe in letting the public hear the scores in our productions. It's good advertising, and is a strong boost for business.

"It is the composer who is protesting against the use of the music, and on what grounds I haven't been able to figure out. To begin with the music is the property of the producer. He purchased it and has a right to let it be broadcast if he wants to. As it happens, we all do want to." Accordingly, the radio committee of the Producers' Association will take steps to open the music of the various shows to the broadcasting stations without charge.

Cockaday Circuit

The newest and most startling development in radio

Exceedingly Selective. Simple to Operate. Highly Sensitive. Verified C.W. Range of 1200 Miles. Telephone Range of 2400 Miles.

Complete Parts for This Circuit.

$12.71

Include the following:

1 Special Coil	$3.25
2 Variable Condensers (Bakelite Ends)	3.00
1 Socket (Genuine Condensite)	.50
1 Vernier Rheostat (Cutler-Hammer)	1.30
1 Panel (Genuine Bakelite), 7 x 18	2.50
1 Grid Condenser, Mica Dubilier .00025	.35
1 Switch Lever, 7 Points, 2 Steps	.31
8 Binding Posts	.40
1 Grid Leak (Cartridge Type) and Bakelite Holder	.60
2 Dials, 3 Inch	.50
Total	$12.71
One Stage Amplifying Unit to This Set, Additional	$5.00
Two Stages, Additional	11.00
Cabinets, Piano Mahogany Finish, One Bulb Set	$3.75
Two and Three Bulb Set	4.75

Complete Parts for Flewelling and Reflex Circuits.

U. V. 200 Tubes	$3.95
DeForest DV6A. Wonderful as an amplifying tube	6.00
22½ Volt "B" Battery	.89
Nathaniel Baldwin Type C, Double Phones	8.50
Nathaniel Baldwin Type C, Single Phones	4.50
Braedes (Superior) Phones	5.95
45 V. "B" Batteries (each)	2.25

All orders must be accompanied with a money order postage included.

GRAND RADIO CO.

1789 Third Ave. 1714 Second Ave.

NEW YORK CITY

Pointers You Should Know When Installing

A FEW pointers regarding the installation of the receiving set should prove valuable for every one who owns a radio set. As a matter of fact one need pay little attention to the installation of the simple sets, for the reason that their simplicity limits their efficency, so that finer details of installation hardly apply to them. When it comes to elaborate vacuum tube receiving sets, it may be well to give a little thought to the installation for the purpose of obtaining the utmost efficiency. So says the New York "Globe," and continues:

To begin with the receiving apparatus should be placed so as to permit the shortest possible leads from the receiving where the lead-in enters the room. The lead-in should be short as possible. Sufficient space should be provided between the instruments and the desk of operating table so as to make easy the manipulations of the receiver.

The antenna leading from the lightning switch should pass through an insulator when coming through the wall and the ground wire, which is number 14 rubber-covered copper wire, should be brought in very carefully. With all these in mind we should be able then to check up our weakness elsewhere should we have the occasion to do so.

SHORT CUT

Replaces aerials, loops, electric light plugs, etc. Brings clearer signals and truer tone.

Postpaid $5.00

SHORT CUT RADIO CORP.

243 W. 54th ST. NEW YORK

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The publishers of Radio World have at last succeeded in getting a binder that will securely hold a full volume of this publication (26 numbers).

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(Sent parcel post prepaid.)

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1493 BROADWAY NEW YORK

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Owing to the increase in the sales of Radio World and the fact that the paper has to be sent to press earlier than formerly, no cancellation of or changes in advertisements can be accepted after Wednesday of the week preceding publication.

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Proven the Best

by Laboratory tests, fine adjustment area 18 times that of wire rheostat and several times that of next best filament control.

Ideal Control

For UV 199's

And ALL TUBES

permits Accurate Control of "A" Battery current with infinite adjustment at critical operating point. Utilizes the great tuning possibilities of the tube itself, increasing range of your set.

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Brings in Weak Stations Strong & Clear

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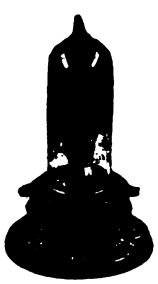

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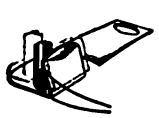

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It's the contact that counts

The dual-wipe contact strips of the Na-ald De Luxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties this socket keeps plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

Price 75 cents

The Na-ald Special Socket No. 499 is a sturdy little socket for the G. E. No. 199 dry-cell tube. It has special slot construction, and is moulded of genuine Bakelite. The heat from soldering connections will not affect these sockets.

Price 50 cents

Booklet with wiring design and instructions for Hazeltine's Neutrodyne circuit, together with other selected circuits, packed with each Na-ald product or sent in exchange for cover taken from any Na-ald carton.

Alden Manufacturing Co.

Dept. L 52 Willow St.
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RADIO PRODUCTS **NA-ALD**

FADA RADIO HANDBOOK

10¢

T-E-L-L-S the "how" about Radio receiving. Worth its weight in gold to every radio fan. Send your dime.
F. A. D. ANDREA, INC.
1381 W. Jerome Ave., N. Y. C.

FADA RADIO EQUIPMENT

You Need It!

Have you seen the hook-up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan. 29? This hook-up actually goes out and drags the distance in, and lays it at your table.

All that is necessary is to lay the full-page diagram of the panel on your own panel and drill

Old WJZ Signs Off For The Last Time

WJZ signed off—for the last time. Station closed down. All's Well"

The operator in charge made this entry in the station log book of WJZ, Newark, N. J., on the night of May 14. It was his last official act. They had ordered away not only his outfit but even his call letters. Old WJZ passed out of the broadcasting firmament in military fashion—quickly, quietly and with dignity.

"Broadcast Central," on top of Aeolian Hall, New York City, inherited the call WJZ and began operations the next night with shiny, new, strictly up-to-the-minute equipment. The juggernaut of progress knows no sentiment.

There are radio fans who swear by old WJZ. It was the first station that many of them ever heard, their ABC in radio broadcasting. WJZ led the field for one and a half years. This is a long life for a broadcasting station, and in that time many others have been built and operated. When WJZ began its first famous broadcast on October 12, 1921, there were only three or four stations broadcasting throughout the land. Today, there are about 600, but in spite of this immense increase WJZ has held its own and in many ways has blazed the trail.

Old WJZ enjoys the distinction of being the first broadcasting station to have its complete program published by a metropolitan newspaper. Lately, over 1,100 newspapers in the United States and foreign countries published the WJZ program.

WJZ could claim a transmitting radius of 2,000 miles. It was heard almost nightly in California and in England. It had followers in Australia, Cuba, South America and Europe. On one occasion, its signals were heard simultaneously in Honolulu and Bremerhaven, Germany, some 10,000 miles!

Mr. William H. Easton, retiring director, made a little farewell speech which was broadcast just before WJZ closed down. He concluded by saying:

"We shall never forget you of the radio audience and we trust that no matter how wonderful the new WJZ may be, you will never forget the first to bear that name. In behalf of the Westinghouse Company, I want to thank you for the splendid cooperation you have given us. I want also to thank the artists who have honored this station with their presence and who have given to you the best of the world's music and thought. And finally, I wish to thank our fellow broadcasting stations for the friendly spirit they have shown us at all times. The Westinghouse Company is not giving up broadcasting, as it will continue the operation of KDKA, Pittsburgh; KYW, Chicago; and WBZ, Springfield. But the voice of WJZ, Newark, N. J., is to be stilled forever. Well, good night, friends—and goodbye!"

From Near the Equator to Schenectady

WGY was recently picked up by the steamship Ebro of the Pacific Steam Navigation Company when one day out from the Juan Fernandez Island, west of Valparaiso, Chili, about 5,400 miles from Schenectady, N. Y., the home of the General Electric Company broadcasting station. Information of the long distance reception was contained in a letter from W. F. Robertson of Cincinnati, Ohio, who was a passenger on the boat. Mr. Robertson stated that the ship's radio operators were using his set.

WGY has been heard greater distances than Mr. Robertson reports, but reception has never been reported as far south as the Juan Fernandez Islands. The distance is remarkable because of the heavy interfer-

SUNBEAM

THE BEST Combination!

SUNBEAM QUALITY goods, to complete the COCKADAY CIRCUIT. One guaranteed, accurate set of coils consisting of one plain and one Bank-wound coil sent postpaid for $2.75

17 plate SUNBEAM QUALITY condenser, heavily nickel-plated, handsome finish, all Bakelite Mt'g. Adapted for the COCKADAY circuit $2.88

Triple Bank-Wound Coil, Silk Wound, to meet the new Government regulation wave-lengths now being allotted. Furnished with hook-up and instructions.....$3.25

Our goods are new in original packages, and our guarantee provides you satisfaction or your money back, we will repay transportation charges if not satisfied.

PHONES

$12.00	Baldwin, double	$9.80
6.00	Baldwin, single	5.25
8.00	Brandes	5.75
8.00	Federal	4.00
6.00	Murdock No. 56	4.25
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RADIOSEAVE LOUD SPEAKER UNIT		3.75
AMPL-TONE PHONES, 2200 Ohms, TESTED AND GUARANTEED		3.75

TRANSFORMERS

$7.00	U. V. 712 R. C.	$5.85
7.00	Federal	4.75
5.00	Acme	3.75
5.75	Kardon	3.50

CONDENSERS

Radio Stores Corp., Bakelite Ends, 23 plate	$3.75
A. B. C., 23 Plate	1.00
Radiant with Geared Vernier:	
23 Plate	5.50
43 Plate	6.00

MIGNON, FORMICA INSERTS

Type A, Plain, 14 Plate	$4.50
Type B, Plain, 26 Plate	5.00
Type C, Plain, 46 Plate	6.00
Type A, Vernier, 14 Plate	6.00
Type B, Vernier, 26 Plate	6.50
Type C, Vernier, 46 Plate	7.50

SOCKETS, V. T.

Bestone, Solid Bakelite	$0.75
Eagle, Bakelite	.60
Good Bakelite Sockets	.50
John Firth	.50
Composite Base	.39

MISCELLANEOUS

Federal Potentiometer	$1.25
Kiesner Rheostat	.70
Filkostat	**2.00**

With the Fil-Ko-Stat you bring in the weak stations strong and clear.

Bradleystat	$1.65
Cutler-Hammer Rheostat	.85
Cutler-Hammer Vernier Rheostat	1.25
JEWELL VOLTMETER—zero to 50 volt	3.00
Sterling Voltmeter—zero to 50 volt	2.50
Cutler-Hammer Battery Switch for panel mounting, Nickel Plated	.75

Sunbeam Detector $45.00
Sunbeam 1 Step Amplifier... 75.00
Sunbeam 2 Step Amplifier... 125.00
(Complete with Tubes, "B" Battery, "A" Battery, Phones, Aerial, etc.)

We will send any set for your approval, you may try it under any and all conditions for ten days, if you are not absolutely satisfied send us the set, and we will return your money.

DeForest, Eveready and all Radio apparatus of SUNBEAM QUALITY available at Best Prices. Our Radio mechanics will complete any radio set to your specifications.

Sunbeam Electric Co.
71 Third Avenue, New York

Farm Lighting Plants at Bargain Prices.

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RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway N. Y. C. (Phone, Bryant 4796).

BROADCASTING OUTFIT using five fifty watt tubes to be sacrificed. Everything complete. Make us an offer. Park City Radio Company, Bowling Green, Ky.

FOR SALE—Two Myers Choke Coils, 8 Myers tube receptacles, three Cot-o-Coil Radio Transformers, all for $15.00. F. T. Lesser, 85 Lincoln St., Ridgway, Pa.

TO THE WIDE-AWAKE! Are you in need of a ribbon for your typewriter? And do you have it handy? Shoot me 50c and I'll send you one. Actual value paid for sick, out-of-order typewriters; if visible or invisible. The men and women of today must have Standard machine. Send for one—any make. Busy B Service. Information on request. John A. Hendrikson, 367 Chicago Ave., Chicago, Ill.

FOR SALE—Twin variometer set with antenna condenser and potentiometer. Two step amplifier in same oak cabinet—specially built for touring. $75.00. Tubes, Batteries, and Baldwin type C Phones, $35.00. One two step amplifier, $20.00. One two step amplifier, $15.00. One Radio Flivver with tube, $17.50. DAVID L. THOMPSON, 766 Kalamath St., Denver, Colo.

MEN AND BOYS, get all the inside information on Radio. Radio Guide, also diagrams and blueprints for home construction aerials, inlaid Radio cabinets. Everything to your electrical knowledge. If interested, write, please. John A. Hendrikson, 367 Chicago Ave., Postal Subs., Chicago, Ill.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

HYPNOTISM—Controls self and others. Wants gratified. Ten easy methods, $1.10. "MIND-READING" (any distance)—Wonderful, $1.10. SCIENCE INSTITUTE, RW 1014 Belmont, Chicago.

CRAM'S RADIO BROADCASTING MAP of the UNITED STATES & CANADA. Scale 100 miles to the inch. In two colors, size 34x28. Printed on high-grade map paper, up to-the-minute information, indicating all amateur and standard broadcasting stations, with complete index to stations. 35c postpaid. The Columbia Print, 1493 Broadway, N. Y. C.

OLD MONEY WANTED—$2.00 to $500.00 **EACH** paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

AUTOMOBILE REPAIRING MADE EASY—By Victor W. Pagé. A thoroughly practical book containing complete directions for making repairs to all parts of the motor car mechanism. Written in a thorough but non-technical manner. Gives plans for workshop construction, suggestions for equipment, power needed, machinery and tools necessary to carry on business successfully. Tells how to overhaul and repair all parts of all automobiles. The information given is founded on practical experience, everything is explained so simply that motorists and students can acquire a full working knowledge of automobile repairing. Other works dealing with repairing cover only certain parts of the car—this work starts with the engine, then considers carburetion, ignition, cooling and lubrication systems. The clutch, change speed gearing and transmission systems are considered in detail. Contains instruction for repairing all types of axles, steering gears and other chassis parts. Many tables, short cuts in figuring and rules of practice are given for the mechanic. Explains fully valve and magneto timing, "tuning" engines, systematic location of trouble, repair of ball and roller bearing, shop kinks, first aid to injured and a multitude of subjects of interest to all in the garage and repair business. This book also contains Special Instructions on Electric Starting, Lighting and Ignition Systems, Tire Repairing and Rebuilding, Autogenous Welding, Brazing and Soldering, Heat Treatment of Steel, Latest Timing Practice, Eight and Twelve-Cylinder Motors, etc., etc., You will never "Get Stuck" on a Job if you own this book. 1,000 specially made engravings on 500 plates. 1,056 pages (5½x8). New Edition. Price

THREE NEW 50 WATT TUBES. Never used. $20 each. W. N. A. B., Bowling Green, Ky.

FREE CATALOGUE. Ebonite panels, 7x12, 50c.; 23 plate variable condensers, $1.25; American No. 200 Tubes, $3.00; Amplifying, $3.75; W. D. 12 Peanut, $5.75; Sockets, 25c. Stewart's Radio Supply Co., 3124 Cherokee St., St. Louis, Mo.

BUILDERS AND EXPERIMENTERS. Do you know that the Reflex circuit is one of the most interesting circuits to construct? You can not guess how much fun you are missing if you fail to try out at least one of these circuits. See RADIO WORLD issues of Feb. 24 and March 3. They contain two fine articles by W. S. Thompson, with plenty of new Reflex circuits to experiment with. Don't miss these! 15c. a copy. RADIO WORLD, 1493 Broadway, New York City.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

A WONDERFUL CRYSTAL SET. Can hear all over Philadelphia, and sometimes outside of Philadelphia. Price with phones, $12.00; without phones, $6.00. Receiving sets, $35 to $200. Guaranteed or money back. Send Money Order or call. Williams Radio, 2339 N. 8th St., Philadelphia, Pa.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 20,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable industance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 90% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

ELEMENTS OF RADIO TELEPHONY, by Wm. C. Ballard, Jr. A standard book on radio telephony, the work of a recognized authority. Accurate, simple, clear, reliable and strictly up-to-date. For the technical man who wants to post himself on radio and for the radio enthusiast who wants the fundamental principles of radio and their application tersely and entertainingly presented. Price, postpaid, $1.50. The Columbia Print, 1493 Broadway, New York.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City

MOTOR BOATS AND BOAT MOTORS—By V. W. Pagé and A. C. Leitch. All who are interested in motor boats will find this latest work a most comprehensive treatise on the design, construction, operation and repair of motor boats and their power plants. It is really two complete books in one cover, as it consists of two parts, each complete in itself. Part one deals with THE HULL AND ITS FITTINGS, part two considers THE POWER PLANT AND ITS AUXILIARIES. A valuable feature of this book is the complete set of dimensioned working drawings detailing the construction of five different types of boats ranging from a 16-foot shallow draft, tunnel stern general utility craft to a 25-foot cabin cruiser. It is a comprehensive work of reference for all interested in motor boating in any

Reinhold Radio Detector. A CHEMICAL DETECTOR. Every spot equally sensitive. Lasts indefinitely. Permanent graphite contact. Ideal for reflex circuits. $1.50 prepaid. WARRENDARCY RADIO COMPANY, 1441 Broadway, N. Y.

MAKE YOUR OWN storage "B" batteries. RECTIFIER and D. C. recharger. BLUE PRINTS $1. S. Marchese, P. O. Box 417, Brooklyn, N. Y.

ARE YOU IN THE RADIO BUSINESS? If so, drop us a card for price list. If not, let us start you in a good paying business. We furnish everything and have a proposition that meets the needs of 90% of the public. Liberal discounts to agents. Immediate delivery. Write today. THE WILKENDA COMPANY, 500 Fifth Avenue, New York.

VACUUM TUBE RESULTS FROM A CRYSTAL SET! A "PT" Ultra-Sensitive Contact will increase the range and audibility of your crystal set. We guarantee this wonderful Contact to be MORE SENSITIVE THAN ANY OTHER CAT-WHISKER MADE; and that IT WILL NOT JAR OUT. WITH A "PT" MYRLE WOOD HEARD 46 PHONE STATIONS, IN A THOUSAND-MILE RADIUS! Others likewise testify that the "PT" has given results equaling tube equipment. Simple to install in any crystal detector. Price only twenty-five cents coin. "PT" CRYSTAL CONTACT COMPANY, Box 1641, BOSTON.

Build your sets with quality parts and get sure results. Radio Parts Co., Box 56, Dunellen, N. J.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

EXCHANGE LETTERS with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

RADIO FANS AND PROFESSIONALS—How many of you know the correct CODIFICATION of all characters, punctuations and signs (such as $, %, etc.). We dare say that nine out of ten don't know them correctly! Our instructor who has had 35 years experience, eight years of which were with Uncle Sam as MORSE and RADIO TELEGRAPHER, has just published the first and only CHART known to give fully a true and correct CODIFICATION of ALL characters used in both codes. This CHART is indispensable to all up-to-date beginners and veterans alike. Fifty cents (money order preferred) will bring CHART, also much information extremely interesting to BOYS and GIRLS; because, with this information and a little PEP on your part, you can qualify shortly (as scores of our graduates have done) and secure positions paying $1,500 to $3,000 yearly. (See Civil Service Bulletins 215, 157 and 54.) We are registered with the U. S. C. S. Com. at Washington and can help you. AMERICAN TELEGRAPHIC STUDIO, BOX 793, WORCESTER, MASS.

TWENTIETH CENTURY BOOK OF RECIPES, FORMULAS AND PROCESSES—Edited by Gardner D. Hiscox. This book of 800 pages is the most complete book of recipes ever published, giving thousands of recipes for the manufacture of valuable articles for every-day use. Hints, helps, practical ideas and secret processes are revealed within its pages. It covers every branch of the useful arts and tells thousands of ways of making money and is just the book everyone should have at his command. The pages are filled with matters of intense interest and immeasurable practical value to the photographer, the perfumer, the foundryman, the machinist, the potter, the tanner, the confectioner, the chiropodist, the manufacturer of chemical novelties and toilet preparations, the dyer, the electroplater, the enameler, the watchmaker, the jeweler, the ink manufacturer, the optician, the farmer, the dairyman, the paper maker, the metal worker, the soap maker and the technologist in general. A book to which you may turn with confidence that you will find what you are looking for. A mine of information up-to-date in every respect. Contains an immense number of formulas that everyone ought

Short Radio Waves Transmitted in Beam Like Searchlight Reduce Interference

WITH the development of radiotelephone transmitting apparatus the transmission of the voice or music broadcast by radio has assumed an important place in the radio field. Radio waves which are transmitting the voice or music occupy a wider band of wave lengths than a "sharp" wave transmitting radiotelegraph signals. Because of this great increase in a kind of service which requires a wide band of wave lengths there is already considerable interference among broadcasting stations, and between broadcasting stations and radiotelegraph stations.

These authorities state that, for point-to-point communication, there are two important ways of reducing such interference; that is, to direct the waves radiated from the transmitting stations in a narrow beam toward the receiving station, and to use short wave lengths which are not at present employed.

Some English investigators have recently reported on the results of their investigations on directive short-wave transmission.

Experiments have recently been conducted at the Bureau of Standards on transmitting apparatus employing electron tubes, which transmits a directed beam of radio waves, and employs waves as short as 10 meters. This system, therefore, offers substantial relief from interference difficulties. It also has possible military applications. The apparatus has been used for communication by both radiotelegraphy and radiotelephony.

In the experiments at the Bureau of Standards a reflector has been used consisting of short parallel vertical wires, arranged on a frame shaped like a parabola. This reflector acts much like an ordinary mirror would for light waves. The radio waves are, in fact, the same kind of waves as light waves, but of considerably longer length. Forty vertical wires were used, and the generating set with its small antenna was placed at the focus of the parabola. Each wire was tuned separately to 10 meters by adjusting its length. It was found that about 75 per cent of the radiated energy could be confined within an angle of about 75 degrees.

This apparatus is described in Scientific Paper No. 469 of the Bureau of Standards, entitled "Directive Radio Transmission on a Wave Length of Ten Meters," by F. W. Dunmore and F. H. Engel. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is 10 cents.

Opportunity for Radio Development in China

THE time seems ripe for radio broadcasting in China," says G. W. Van Tubergen, of the International Western Electric Co., who has just returned from that country. Radio should prove a distinct advantage to the Chinese people as those living in the small cities and villages even though only a few hundred miles from the larger cities are shut off from all direct contact with the larger life of their own country to say nothing of international happenings. Communication between villages is very restricted. It is literally by oxcart. And it is said that these places make up 90 per cent of China.

"It is very evident to those of us who daily enjoy the advantages of radio that these people living in the interior villages could have the privilege of listening to news reports, music, lectures and sermons and the like broadcast for them from Tientsin and

Radio Control in Great Britain

RECENT developments in England indicate that a strong effort will soon be made to relieve the amateur radio operator in that country from having to pay a proposed increase in license and buy his apparatus from the British Broadcasting Company. Radical steps to break the alleged monopoly are predicted, although they may not remove the bar against foreign manufactured radiotelephone sets. If development is to be permitted the whole situation must be simplified, many believe.

The new postmaster-general is said not to be especially sympathetic toward the present arrangement, but it is felt he will insist that apparatus be of United Kingdom manufacture. Many fans in Great Britain want to make their own receiving sets and utilize some manufactured parts. Today these radio fans can only secure an experimenter's license, but after receiving their permits they can use any kind of a set or part they desire, and listen in on all stations. These licenses, it is reported, remove them from the control of the British Broadcasting Company. It is assumed that they are engaged in experimental work, but they undoubtedly listen in on all broadcasting concerts.

The Radio Manufacturers' Association has suggested abandoning the present method of securing revenue for the broadcasting company by license fees and royalties, and collecting the amount necessary for adequate revenue from the license fee. Restrictions against the so-called "pirate" would then be tightened.

According to a statement in Parliament 35,383 experimental licenses have been issued, while as many more applications are on file. It is estimated that 200,000 individuals are using sets without licenses because they cannot secure the licenses they desire.

Studying Foreign Languages by Radio

SCHOOLS in Sheffield, England, recently had the privilege of listening to French prose and poetry broadcast from a French radio station. The director-general of the French Radio Service consented to cooperate with Mr. F. Lloyd, president of the Sheffield District Wireless Society, in an effort to provide for foreign language students the broadcasting of standard and classical foreign literature. It is hoped that this first-hand instruction can be extended to include the broadcasting of English, German, Italian and Spanish language lessons.

Summer Static Overcome

"Good-bye Aerial"

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No aerial or antenna needed

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Broadcasting in India

BROADCASTING in India will probably be limited to a single company, composed of British and Indian firms, according to a report of the recent Delhi conference forwarded to the Department of Commerce by Vice Consul Harold Shantz, Calcutta. Non-British firms will not be allowed to participate, it is said.

The Director of Wireless has pointed out that under the proposed license an imported set of apparatus would only be authorized if of British manufacture but that it would be permissible to buy parts from the United States or other foreign countries and assemble them in India. The director said that the proposed company would be essentially an Indian one, registered in India and with headquarters there.

It is understood that the manufacture of receiving sets is to be undertaken in India as soon as practicable by the new broadcasting company; this will probably at first consist of the importation of some parts, the local manufacture of others, and the assembling of complete sets.

In this connection it may be observed that at the present time no wireless equipment can be imported into India which is not for Government use, except under a special import license from the Director of Wireless, and by persons who are licensed to operate.

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Radio Situation in Ireland

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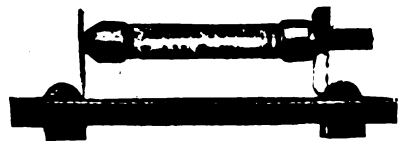

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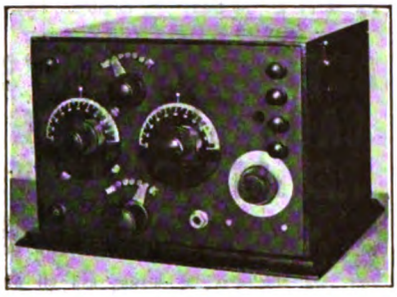

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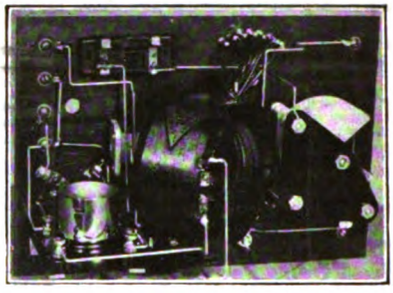

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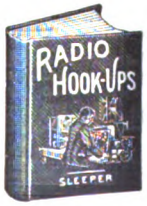

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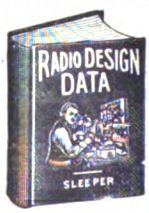

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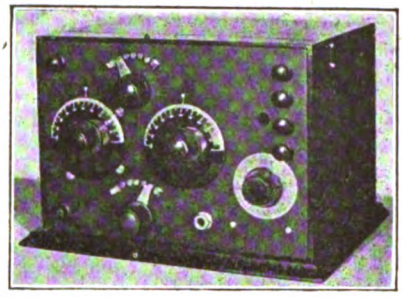

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"B" BATTERIES

Eveready, 45 volt	$4.40
Eveready, 22½ volt, large	2.40
Eveready, 22½ volt, small	1.40
Volton, 45 volt, large	3.90
Volton, 22½ volt, large	2.20
Volton, 22½ volt, small	1.20
Franco, 45 volt	3.70
Franco, 22½ volt	2.20
Franco, 22½ volt, medium	1.40

"A" BATTERIES

Eveready, 110 A. 6-V.	$19.00
Eveready, 90 A. 6-V.	16.50
Eveready, 50 A. 6-V.	13.50
Eveready, 1½ Volt, 300 A.	2.50

PHONES

$12.00 Baldwin, double	$9.80
6.00 Baldwin, single	5.25
8.00 Brandes	5.75
8.00 Federal	4.90
6.00 Murdock No. 56	4.25
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7.00 Federal	4.75
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5.75 Kardon	3.50

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Radio Stores Corp., Bakelite Ends, 23 plate	$3.75
A. B. C., 23 Plate	1.60
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Bestone, Solid Bakelite	$0.75
Eagle, Bakelite	.60
Good Bakelite Sockets	.50
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Filkostat 2.00
With the Fil-Ko-Stat you bring in the weak stations strong and clear.

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Dayton-Fan Variocoupler	6.50
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Sunbeam 1 Step Amplifier... 75.00
Sunbeam 2 Step Amplifier... 125.00
(Complete with Tubes, "B" Battery, "A" Battery, Phones, Aerial, etc.)

We will send any set for your approval, you may try it under any and all conditions for ten days, if you are not absolutely satisfied send us the set, and we will return your money.

Sunbeam Detector and 1-Step	$12.00
Sunbeam Detector and 2-Step	18.00
Also 2-Step Unit	14.50

Assembled Jacks, Sockets, Transformers, etc., ready in one piece for mounting. Most compact unit available.

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See List Of Summer Camps In This and Other Issues Of RADIO WORLD

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

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Pack Your Radio In Your Old Kit Bag—And Smile, Smile, Smile!

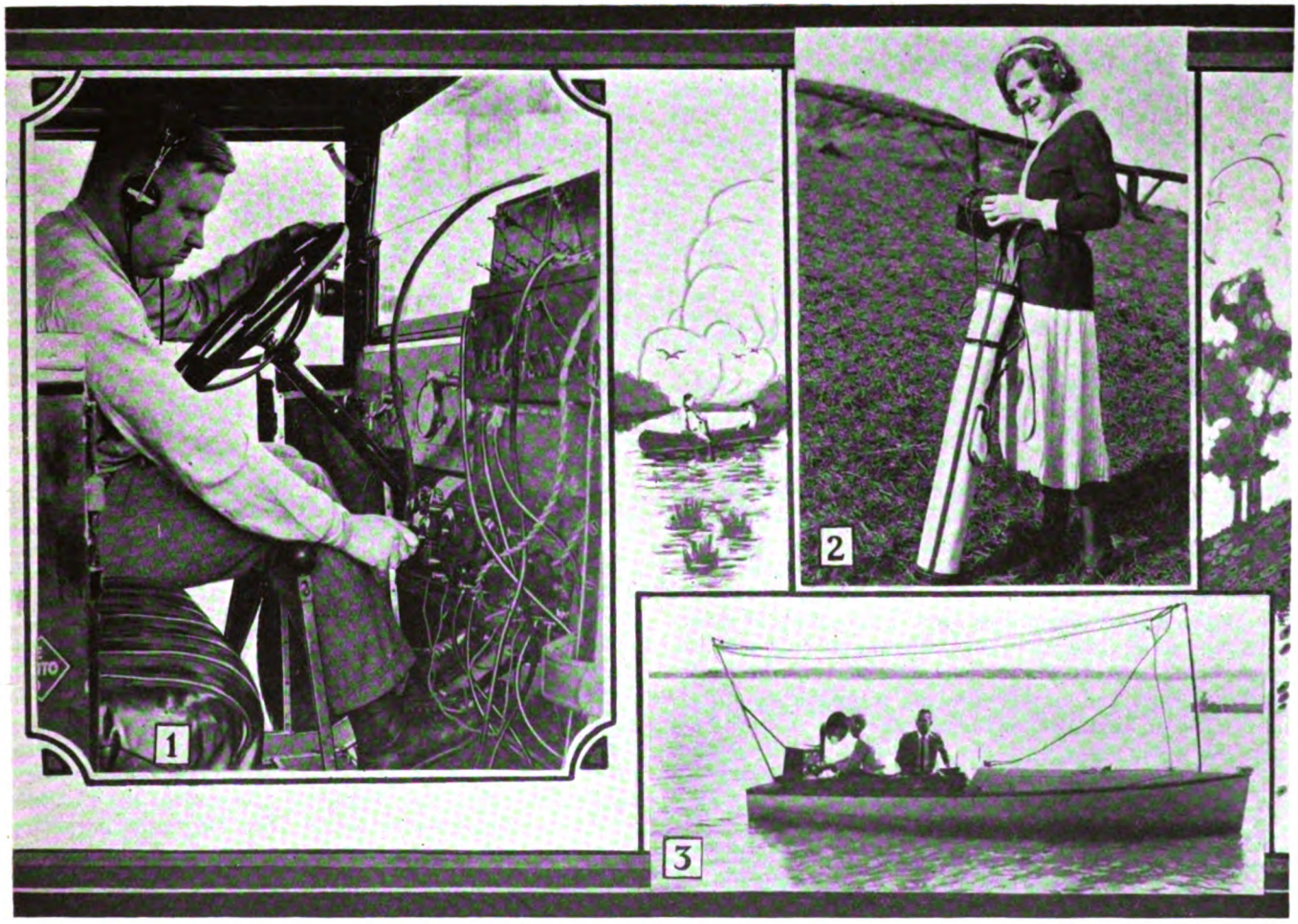
VACATION TIME—the time we all look forward to! The time we shake the dust of the cities from our shoes and prepare to inhale the sweet odor of new-mown hay and put away our troubles and accumulate a good coat of tan.

No matter where you go, farm, woods, mountains, seashore, boating, think of the fun you can have by taking your radio set along with you and not missing your favorite program or concert, and at the same time have the laugh on the folks obliged to stay and swelter in the city.

All you need to do these spring days is to walk through some of the residential sections, or near any private garage, or boat house, and you will see the owners busily equipping their cars and boats with radio sets. A great many are building special sets to put on their boats and take away to camp with them.

Can you imagine anything nicer than sitting around the campfire with the glow of the flames jumping up and casting weird shadows into the dark places, and at the same time listening to Miss Vaughn de Leath and her original radio boys playing "You Gotta See Mamma" or listening to the Symphony in G minor played by Paderewski while sitting comfortably on the porch of your hotel while the crickets and locusts announce the fact that it's going to be a "corking warm day tomorrow"?

Don't just think about it, fan! Look at the pictures on this page and get busy. It won't take you very long to do it, and think of the fun you can have.



(Photos copyrighted by Fotograms, N. Y., and International Newsreel)

No. 1. Who says we can't go radiomotoring? Here is how a rabid enthusiast installed his five-tube set with antenna atop the car so that he wouldn't miss a single thing while going up to the mountains.

No. 2. Did you slice it? Well, just take along that portable tube set, and get a lesson on control from station XZZ and let the next one land plump on the green for a birdie. This is "radio golf" for fair!

No. 3. Atta boy, Petey! Charm those fish with a selection from Faust and then they'll bite without even coaxing. Even at that, isn't it more pleasant to listen to a vocal solo than the "Put-put-put-put" of that dinky motor?

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Wigwagging With Sharps and Flats

By J. E. Anderson, M. A.

DURING the last three years the writer has been experimenting with a system of signalling which may be called acoustic wigwagging. In certain respects it resembles the system recently announced by General Squier of the Signal Corps of the Army, but instead of using a variation of the intensity of the signal to represent dots and dashes, a variation of the frequency of signal tone has been employed. For instance, the dot is represented by a short duration of a certain audible frequency and the dash with an equal duration of a somewhat lower frequency. Thus a message consists of a sequence of ups and downs of the pitch of the signal tone. At times a third reference frequency lying midway between the other two has been used to facilitate aural reception, in which case the dot is given by a sudden increase in this frequency and the dash by a sudden decrease. Thus signalling becomes a type of wigwagging about the middle reference tone.

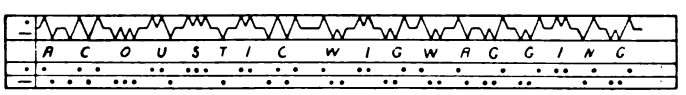
The advantage of this method is especially noticeable in aural reception. Most ears, even if they are not highly musical, are capable of differentiating between two musical tones separated by a fairly small interval, and a coincident variation in the intensity is not a serious matter. The power of the ear to distinguish between two tones is especially great when there is a third frequency with which to compare them. It is easy to tell a sudden drop in a 1,000-cycle frequency to 950, or a sudden rise to 1,050. It is still easier to tell the same absolute variation when the middle reference frequency is a hundred cycles per second. In high speed signalling this auxiliary frequency becomes confusing and it is best not to send it in the body of the message; that is, between dots and dashes and between letters and words. It is still useful, however, at the beginning of signalling after a moment of interruption, and when tuning in on the transmitting station.

When using a variation in the intensity of the signal to represent dots and dashes the ear is unable to differentiate between two intensities unless their ratio differs considerably from unity, and it is impossible to tell whether a sudden change in the intensity is intentional or due to an abrupt change in the attenuation characteristic of the electrical circuit.

This system of acoustic wigwagging is applicable to direct and carrier transmission alike. If instrumental reception is used as well as aural, the frequencies available for use range from the lowest audible to the highest radio for both carrier and direct transmission.

The transmitter for such a system does not differ greatly from the ordinary. The chief difference lies in the oscillator generating the signal frequencies. If the reference frequency is not transmitted the controling key is a single pole double throw switch by means of which one of two condensers may be thrown in parallel with the oscillating coil, the capacities of these being so proportioned as to give the desired frequency interval. It may also be accomplished with a series-parallel switch whereby the two condensers are first either connected in series or in parallel before being connected across the coil. If the reference frequency is transmitted three condensers are used, and the key so arranged that any one of them may be picked up and connected to the oscillating coil. The smallest of these condensers will give the dots, the middle the reference tone, and the largest the dashes.

The circuit used in aural reception is an ordinary receiver and needs no further comment. But when it is desired to render the signals visible, or to record them on a tape, the receiver is somewhat more complicated. The reference frequency is now undesirable and is not used. A tuned circuit is used for each of the signal frequencies. The incoming oscillations are first detected, and then the two signal frequencies are selected by the tuned circuits and separately amplified. The output of the two amplifiers is then used to operate the recording devices. For this purpose a siphon recorder may be used and so arranged that one amplifier pulls the writing point to one side of a median line and the other amplifier in the opposite. A galvanometer in conjunction with a photographic recording device may be also used in the same manner. A better way is to print the message in dots on either side of the median line of a tape. A dot above the line would be a dot in the code and a dot below the line would represent a dash. To operate the printing points local relays are necessary, which are controlled by the incoming signal frequencies. The printing may also be done photographically in which the relays operate two shutters. The two methods of recording a message are illustrated in the accompanying drawing.



Punched tape and recording tape used in "Acoustic Wigwagging." The upper is the received signal and the lower the perforated tape to be sent through the transmitter.

The use of the system described here would increase the possible speed of signalling. The English alphabet as expressed in the International Morse code contains 178 units of time, divided into 38 dashes, 44 dots and 56 spaces. Of these 38 units, or half the units alloted to dashes, are saved. Then assuming that the dots and dashes are equally distributed in a message, there would be an increase in the possible speed of 27 per cent. In the transmission of numerals there would be an increase of 22 per cent., or they could be transmitted in .78 of the original time. A considerably greater increase could be effected by rearranging the alphabet in accordance with the frequency of occurrence of the letters in average English discourse. That is, the two single unit characters should be assigned to the two letters occurring most frequently, the four two unit characters to the four next letters occurring the greatest number of times, and so on.

In ordinary dot and dash transmission, and in the intensity variation system there is only one signal tone. In the system described here there are at least two. An objection has therefore been raised that it takes a wider wave band and is wasteful to the available spectrum. For low frequencies this may be a real objection, but for radio frequencies it is of no consequence. Suppose communication is carried on with a wave length of 400 meters or a frequency of 750 kilocycles. Let the signalling tones be 750 and 1,250 cycles per second. They are separated by an interval sufficiently great to allow complete separation by reasonably selective circuits, and yet when they are modulated with the radio frequency current the total width of the sideband is only one part in 1,500. This would lie well within the resonance characteristic of the radio frequency tuned circuit, and many such channels could be used on the same carrier before it would interfere.

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Highly Selective Loose Coupled Circuit Receiver

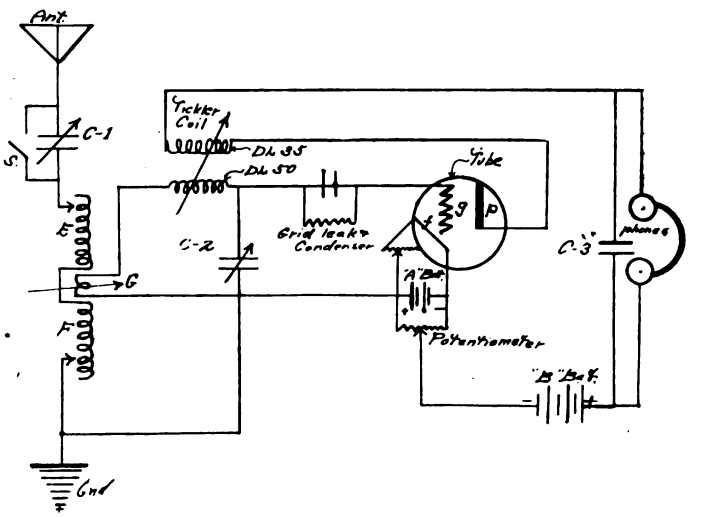
By C. White, Consulting Engineer

THERE has been quite a lot of interest taken of late in coupled circuits of various types. And there has been a lot of misunderstanding and exaggerations as to the benefits of a double and triple circuit receiver. Many have claimed wonderful selectivity with coupled circuits while others have obtained only mediocre results. If two stations are operating on exactly the same wave length and they come in with the same intensity there is no circuit yet developed that will enable you to select one from the other. It is true that we can resort to different tricks to reduce the intensity of one and augment the intensity of the other. One of the most common methods of doing this is to resort to a directional antenna or loop if the two stations happen not to lie in the same direction from the receiver. But it is generally the case that the two are not exactly on the same actual wave length and differentiation or selection can be accomplished by means of a more sensitively tuned or resonant circuit. Then again, if they are on the same wave length, one is most likely louder than the other in audibility to an appreciable extent, thus allowing the coupling to differentiate between the two if the tuner is of the coupled circuit type.

I shall not go into the theory of coupled circuits for Mr. Thompson in previous issues of RADIO WORLD has well covered the subject. But some users of coupled circuits have failed to get the theoretically good results they should because the coupling has been entirely too critical or tight. Then again, the fit between the rotor and stator has been so close that electrostatic coupling has existed when the electromagnetic coupling was zero. Which fact is quite easily explained since the turns on the rotor and stator of the coupler form a condenser whose capacity is not by any means negligible especially when the clearance between the two is very small. There are several methods in vogue to keep this undesirable capacity as low as possible. One method is to make the clearance very large relatively, and another is to place only a few turns on the rotor and have the amount of inductance needed to supply resonance in the secondary circuit added external to the rotor by means of another inductance coil. This fact cannot only be taken advantage of to get the loose coupling, but the tickler coil can be made to feed back into this fixed added inductance. The advantage to be gained by the latter is smooth and even regeneration with more independence of control. With the old, or I should say the more common, system the tickler coil feeds back directly to the secondary rotor and the amount of regeneration was very much dependent upon the coupling and tuning of the primary circuit. It is a great help to be able to set your regeneration to a maximum and then go ahead and finish the fine points in the final tuning in, without the disagreeable annoyance of the tube jumping into sudden oscillation or spilling over.

In the accompanying illustration is shown the essential connections of the circuit. The unit E, F, G is the main tuning unit. The coils E and F form the stator of the element. The coil E consists of 25 turns tapped every five turns while the coil F consists of 25 turns the last 10 of which are tapped every two turns to allow finer adjustment of inductance. The whole stator is wound on a four inch bakelite or formica tube with No. 18 D.C.C. magnet wire. The coils should be wound with a piece of string between each turn to assure a spacing between any two adjacent wires of each coil. The spacing between the coils E and F should be ample enough to allow room for the rotor shaft to pass through with sufficient clearance on each side. The rotor (G) should be wound on a good insulated form and have only five turns of No. 18 D.C.C. wire, spaced in a similar manner as the stator turns. After the coils are wound with the string between each turn they can be coated with coil cement and upon drying the string can be removed. The reason for using No. 18 wire is to keep the resistance of the tuning circuit as low as possible and the reason for spacing the turns is to keep the amount of distributed capacity of the coils at a minimum. Of course, a smaller size of wire could have been employed for the rotor coil G, but why go to the trouble and expense of purchasing another size wire? A honeycomb coil (DL50) is used to complete the inductance quota for the secondary while a honeycomb (DL35) is inductively coupled to the former to obtain regeneration. These two coils should be provided with satisfactory mounts in order gradually to adjust the coupling. If a DL35 coil is not easily procurable a DL50 can be substituted.

The condenser C-1 of the primary tuning circuit is an



Do you want selectivity? Then construct this set and you will get it.

ordinary 11 plate air variable shunted with a short-circuit switch to allow the primary to operate untuned if such is preferable. The condenser C-2 is of similar type and size and is used to tune the secondary circuit. Some prefer to operate with the secondary untuned and the primary tuned, but if the condenser is placed in the circuit the amateur will have his choice and can easily weigh the merits of each method. The grid leak resistance and the grid leak condenser will depend solely upon the kind of vacuum tube employed as a detector. Generally two megohms and .00025 mfd. capacity will suffice for most cases. The condenser C-3 is a mica by-pass condenser of .001 mfd. A potentiometer is provided in order to furnish a further fine adjustment of regeneration.

Those fans who have tried out the regular single circuit regenerative outfit and now wish to change their circuit and experiment will do well to investigate the loose coupled type of receiver. In construction care should be taken to see that the DL50 coil is mounted at right angles and some little distance away from the stator E and F so as to prevent electromagnetic coupling where it is not wanted.

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Some Good Radio Kinks for Yachtsmen

By Arthur S. Gordon

SOME years ago yacht owners awoke to the fact that it was quite possible to take a victrola to sea without running any risk of pounding the records to small bits on the bounding billows. As a result, the laziness of long cruises was somewhat relieved by a snatch or two of music. At the present day, cabin cruisers and houseboats have talking machines built in the cabin woodwork as a matter of course. Now along comes radio with its intense fascination, and progressive yachtsmen are considerably upset. While they haven't as yet ordered radio sets made a part of their boat, like the rudder or the anchor, they are

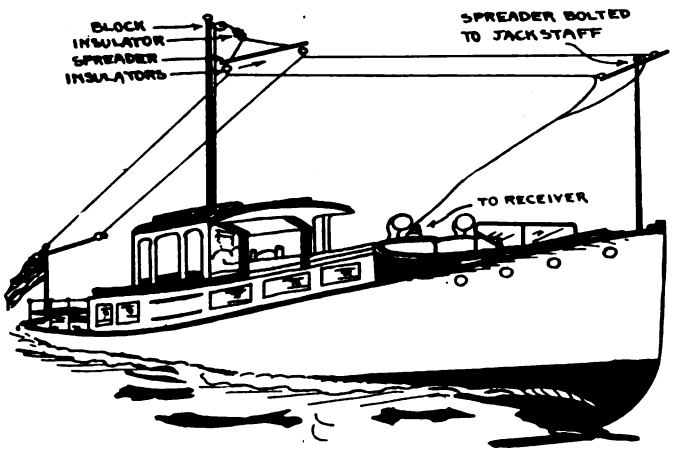


Fig. 1. The antenna installation on a typical cabin cruiser. This not only serves as an antenna, but gives the cruiser a sub-chaser aspect.

wondering why it can't be done—and the answer is, "It can!"

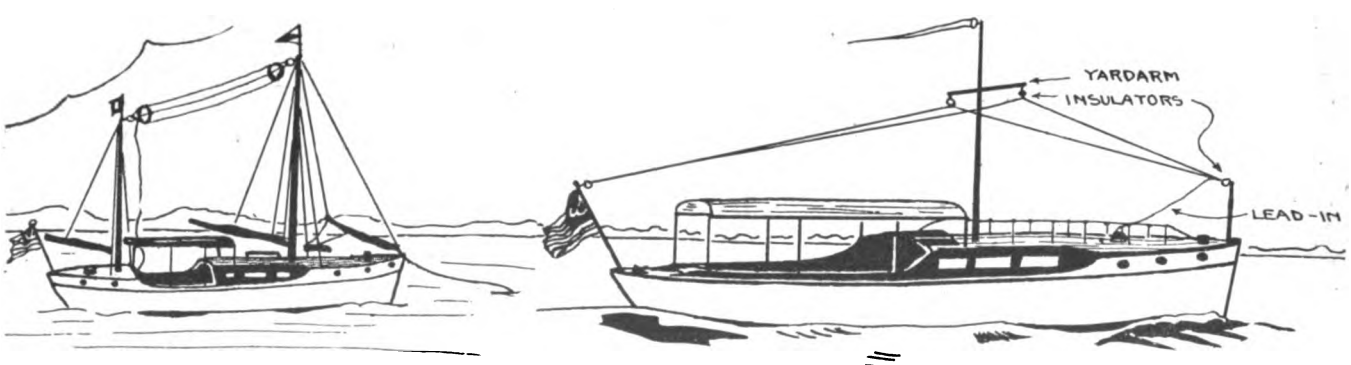
Of course, it isn't practical to load a three, four or five tube set, with batteries and such complete, within the gunwales of a boat that is scarcely large enough to carry an extra hand when the captain-crew-and-cook is on board. Neither is it the height of good sense to install a radio on a speed shingle like "Miss Margaret" or "Miss Broadway." Racing sloops and yawls are also barred, because when they are under way in a stiff breeze, their proud owners just haven't time to do anything else but handle them. Even if they did manage to snatch a moment at a radio set, the angle of their craft would prevent them from enjoying whatever they might hear. With all these vessels out of the contest, therefore, it remains to be said that on the contrary, there are types of boats that just cry out loud for a radio installation. What excuse has the owner of a roomy, comfortable houseboat, for example, or a moderately spacious cabin cruiser, for not having at least a radio receiver on board?

Aside from everything else, the important question with yachtsmen has been, "Is it possible on a small boat, say from 30 to 40 feet over all, to erect an antenna that will function satisfactorily with a moderately priced and easily operated receiver?" The answer is an emphatic "Yes!" Take houseboats, or cabin cruisers, for example. The problem of an antenna on craft of their nature is easily solved. There is always a tall mast afore or abaft the wheelhouse, and this may be used as the high point of the installation. From the masthead a flat top or cage aerial may extend both forward and aft to the jack and flagstaff, respectively, with the lead-in coming from the end nearest to the location of the apparatus. Fig. 1 shows the typical aerial installation on a popular make of cabin cruiser.

Another type of marine antenna, and one that is perhaps seen the most, takes advantage of the crosstree yardarm on the mast. An insulator is hung from each end, and the aerial wires are suspended from them, coming to a point at both the bow and the stern. This is illustrated in Fig. 2. Still another type is that found on auxiliary cruisers with two or more masts. This type resembles more closely than the others the aerial construction on cargo and passenger vessels of the Merchant Marine, and may be either of flat top or cage design. In this case, the lead-in should come down the mast, running either inside the mast hoops or otherwise well clear of any tackle that concerns only the sails of the vessel. This is illustrated in Fig. 3.

The greatest care should be taken in insulating the shipboard aerial. No part of it should touch the vessel. No part of it should be left free to swing or sag against any of the standing or running rigging. This rule of perfect insulation is inflexible where boat aerials are concerned, for it must be remembered that when the yacht is wet from either heavy seas or rain, it is practically grounded.

Otherwise an instrument ground is provided by running a wire from the set to a beam or plate in the vessel, providing that this beam or plate is of metal and connects with the hull, also of metal. If all these should be of wood, provide your own plate by screwing an unpainted strip of copper sheeting on either side of the outer hull just above the keel. This strip should be about one foot wide and four or five feet long. Copper is recommended because of its non-corrosive properties. Some vessels are copper-sheathed just be-



Figs. 2 and 3. Two other methods of installing antenna on different types of boats. The yawl is very difficult because of the limited space; therefore, a cage type antenna is suggested.

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low the waterline. This sheathing is an ideal radio ground. Others have metal bilge keels and these, too, are suitable. The idea is either to provide a metallic area exposed to the water, or a counterpoise in the form of the paint-insulated metal frame of the vessel itself. Should the metal frame not be insulated from the water, all the better.

The antenna-ground installation is not complete on a small boat without a short circuit switch or an arrester gap shunted across the aerial-ground terminals of the set. If a switch is used, the one employed should be of the single pole, single throw type, and should be connected as shown in Fig. 4. In this diagram, the switch may be replaced by an arrester gap, the only difference being that the gap is automatic, while the switch needs faithful attention, to be at all effective when the time comes for it to function. It will be noticed that the same ground is used for both the gap and the receiver. This is contrary to house practice, but on a boat there are neither legal nor technical objections to such an arrangement.

Although it is not "such a much," the masthead aerial is surely the equal of attic antennae, molding aerials, and the electric lighting circuit. If amateurs can do creditable D X work with these indoor makeshifts, using only a two or three tube straight audio-frequency hook-up, what is to prevent the yachtsman from doing the same with his miniature aerial? Too many people assume that because a fellow has a boat, he is a millionaire. They also assume that he is of that peculiar breed of human beings who want nothing but the very latest, regardless of the good points possessed by standard and well-tried outfits. Acting under these generous delusions, they recommend to the yacht owner a high-voltage, multi-tube, myriad knob affair that even a radio engineer couldn't handle on dry land, let alone a comparative novice on the deep sea. This, of course, is all wrong. Four or five tubes are not necessary. On the contrary, a single tube receiver stationed in New York harbor and vicinity should bring in the big New York and Newark stations without any trouble whatever.

For off-coast cruisers, however, at least a three tube set is recommended. The conventional regenerative circuit employing one tube as a detector and the other two as amplifiers is quite all right, but if the extra transformers do not complicate matters, it is much more efficient to employ the recently popularized reflex circuit, in which each tube is made to do double duty as both a radio-frequency and audio-frequency amplifier. Should the reflex circuit be used, it is advisable to use a tube instead of a crystal for a detector—that is, unless the prospective operator has come across a synthetic crystal that needs no adjusting whatever. A suitable circuit of this nature is the Grimes inverse duplex, given in Fig. 5. In this circuit there are three tubes, two of which are used in reflex and the third employed solely as a detector. It works surprisingly well with a small shipboard aerial and is therefore suggested as the general type of hook-up which is supremely suited for the yachtsman.

If an owner's fancy runs to loop antennae, and there is room aboard his vessel to swing one, let him select a hook-up in which the loop is not an integral part of the primary tuning system. In other words, a circuit which employs the loop merely as a collector of energy and not as a strongly directional device to tune out one station and bring in another by a mere touch of the loop. Otherwise, he is going to be annoyed by the manner in which the loop turns with the ship's head, and by the irritating regularity with which good concerts suddenly disappear from whence they came. This annoyance is not only present while the yacht is under way, but also while it is swinging at an anchorage.

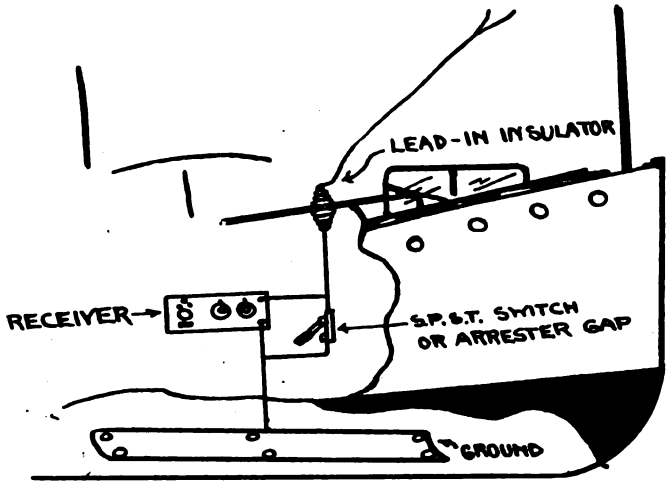

Fig. 4. A safety switch or gap should be provided. The ground can easily be effected by use of a metallic plate, and both instruments and gap are grounded to it.

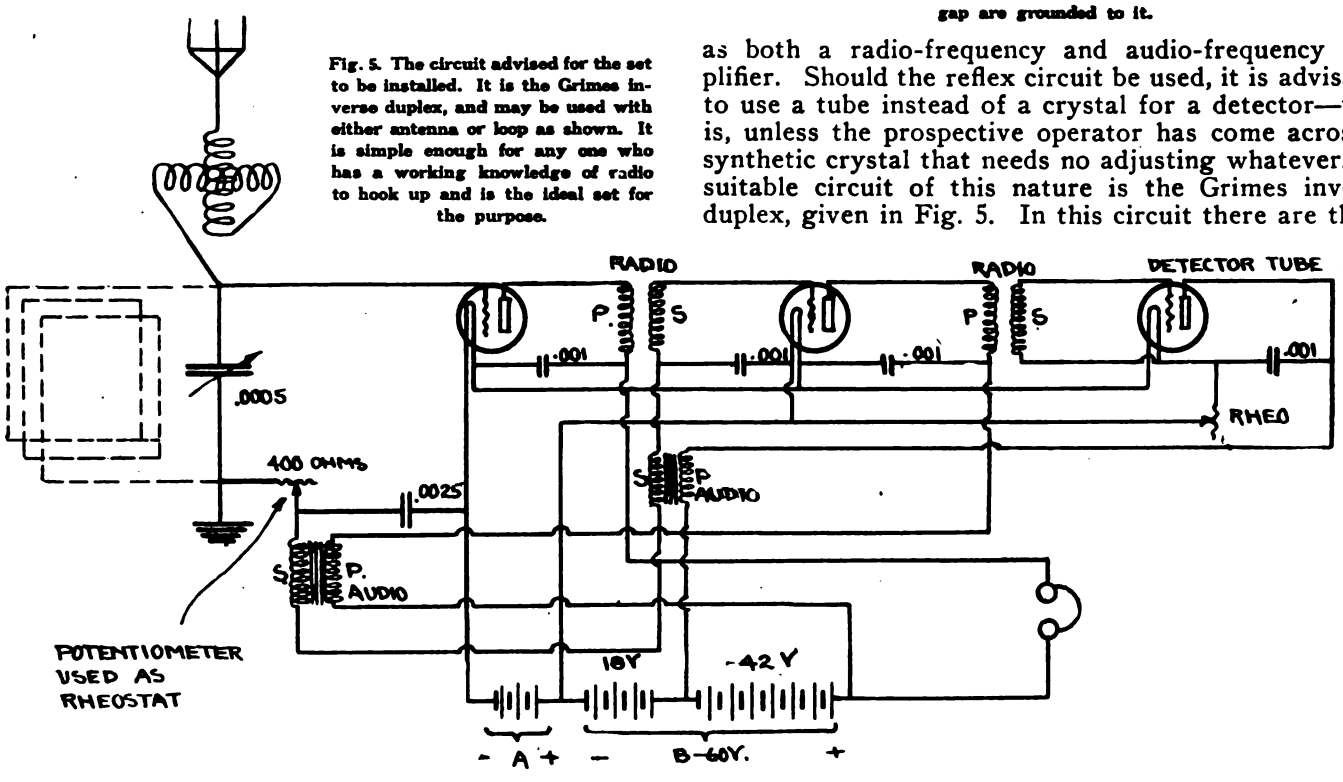

Fig. 5. The circuit advised for the set to be installed. It is the Grimes inverse duplex, and may be used with either antenna or loop as shown. It is simple enough for any one who has a working knowledge of radio to hook up and is the ideal set for the purpose.

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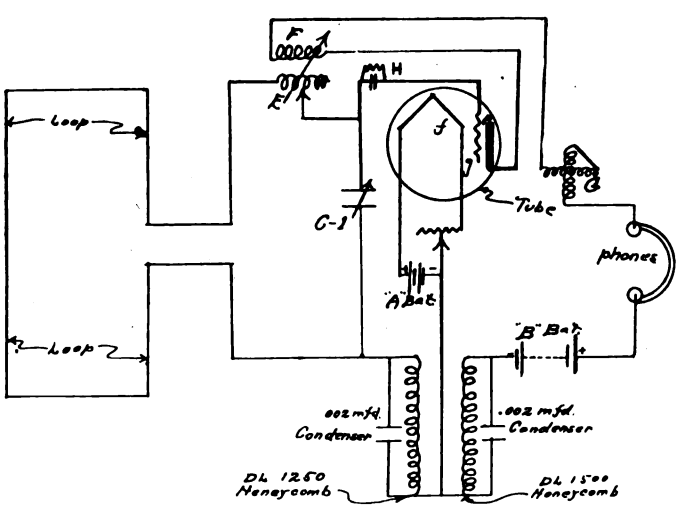
A Portable Loop Aerial Receiver

By C. White, Consulting Engineer

THERE is little doubt in the minds of many radio experts and amateurs that the coming type of antenna will be the loop aerial. The outdoor aerial is not only an excellent collector of atmospherics in the warm weather season, but is equally as proficient in gathering disturbance from Friend Radio Neighbor who does not operate his regenerative receiver properly and generally supplies you with a varied assortment of howls and whistles. Then again, the outside antenna adds little to the selectivity of your outfit and, in fact, in some cases where it is improperly constructed it actually subtracts from the sharpness of tuning. Aside from all these disadvantages it has the added inconvenience of being rather hard to install in most apartment house cities, and does not lend itself to portable radio equipment and field use in summer camps unless exceptional conditions are available. It is, however, many times more efficient than the loop from the standpoint as a collector of radio-frequency signals, but after careful considerations of all its merits and demerits the average fan will agree that it is much



Circuit diagram for a compact loop receiver that can be easily constructed to fit in a small sized suit case or portable cabinet, using the popular dry cell tube.

better to add a tube or change a circuit in order to get rid of it in favor of the loop. If you once get used to the loop with its sharp tuning and quiet operating possibilities you will not for one moment return to the old type of aerial.

It is quite true that a loop aerial can be used on your present regenerative receiver with little or no changes in the circuit you are at present using, but with such an arrangement you cannot hope to pull in the distance that an outside antenna affords. To overcome the low collecting power of the loop we must resort to either radio-frequency, amplification or regeneration on a "super" or "ultra" scale. With the former it will be quite necessary to resort to the use of additional tubes, but by means of the latter we can get remarkable results without the employment of any more tubes than we would have on an ordinary receiver. The circuit that I shall endeavor briefly to outline is nothing more than a modified form of the old "ultra" regenerative circuit. By means of the few modifications it is easier to control and much more flexible to operate than most of the older types which use one tube. Regeneration to an extreme point is easily obtainable with a loop because of its quiet operation and the fact that the fellow next door can not cause your tube to slip or jump into oscillation.

The schematic connections are clearly shown in the accompanying diagram. The loop is about 30 inches long per side and is square in shape. It should be wound with braided copper ribbon or specially stranded radio-frequency wire so as to cut down the high or radio-frequency resistance in order to increase signal strength and selectivity. The coil should have eight turns in all and the corners of the loop frame which supports the wire of the loop should be made of bakelite so as to prevent or minimize high frequency leakage which would be very large if the wires rested on a wooden support such as the body of the frame. The lead or terminal wires running from the loop to the set proper should be kept as far apart as possible and should be well insulated from each other. Every possible means to conserve the small amount of signal energy collected must be exerted. The cabinet holding the working parts ought to be fully shielded with copper foil and the movable plates of the condenser C-1 are to be connected to the filament side of the tuning circuit, which is grounded to the copper foil shielding. In some cases it is advisable to ground to earth connection the copper foil and the negative side of the "A" battery, but better results are often obtained when the set is operated without ground connection to earth. You can easily try out both methods and determine which case better fulfills your requirements.

The constants for the circuit are as follows: C-1 is an 11 plate air variable with some good reliable sort of vernier adjustment or attachment; E is the stator coil of an ordinary variocoupler, while F is the rotor of the coupler; G is a standard type of variometer; and H is a good grid condenser and a reliable grid leak resistance. The two DL honeycomb coils should be furnished with a substantial mounting in order that the coupling between the two may easily be varied. It is not necessary to go to the expense of purchasing an elaborate variocoupler because only a few turns of the stator of this coupler will be in actual use on short wave reception, owing to the fact that the inductance of the loop alone will almost be sufficient to accomplish the necessary tuning, and the plate variometer G will supply most of the regeneration, while the rotor F will perform a sort of vernier regeneration control. The "super" part is accomplished by means of the coupling between the two honeycomb coils, which is kept very loose (that is with the coils far apart) until the receiver has been completely tuned as a regenerative receiver; then it comes into play. By its use the grid of the tube is biased positive and negative at a high frequency rate. The very fact that the biasing is done with alternating current makes it possible to hold the tube on an extremely critical and sensitive point since the negative impulse tends to push it over and the positive pulls it back from oscillation before it gets a chance to respond to the negative pushing impulse.

Let me repeat that this set can be made extremely compact and readily lends itself to camp and field use. It is almost an ideal set to use for summer work since it can be carried complete with very little trouble. For stations not over 25 or 30 miles distant the reception comes in with the volume of a good regenerative receiver using two stages of audio-frequency amplification and an outside aerial.

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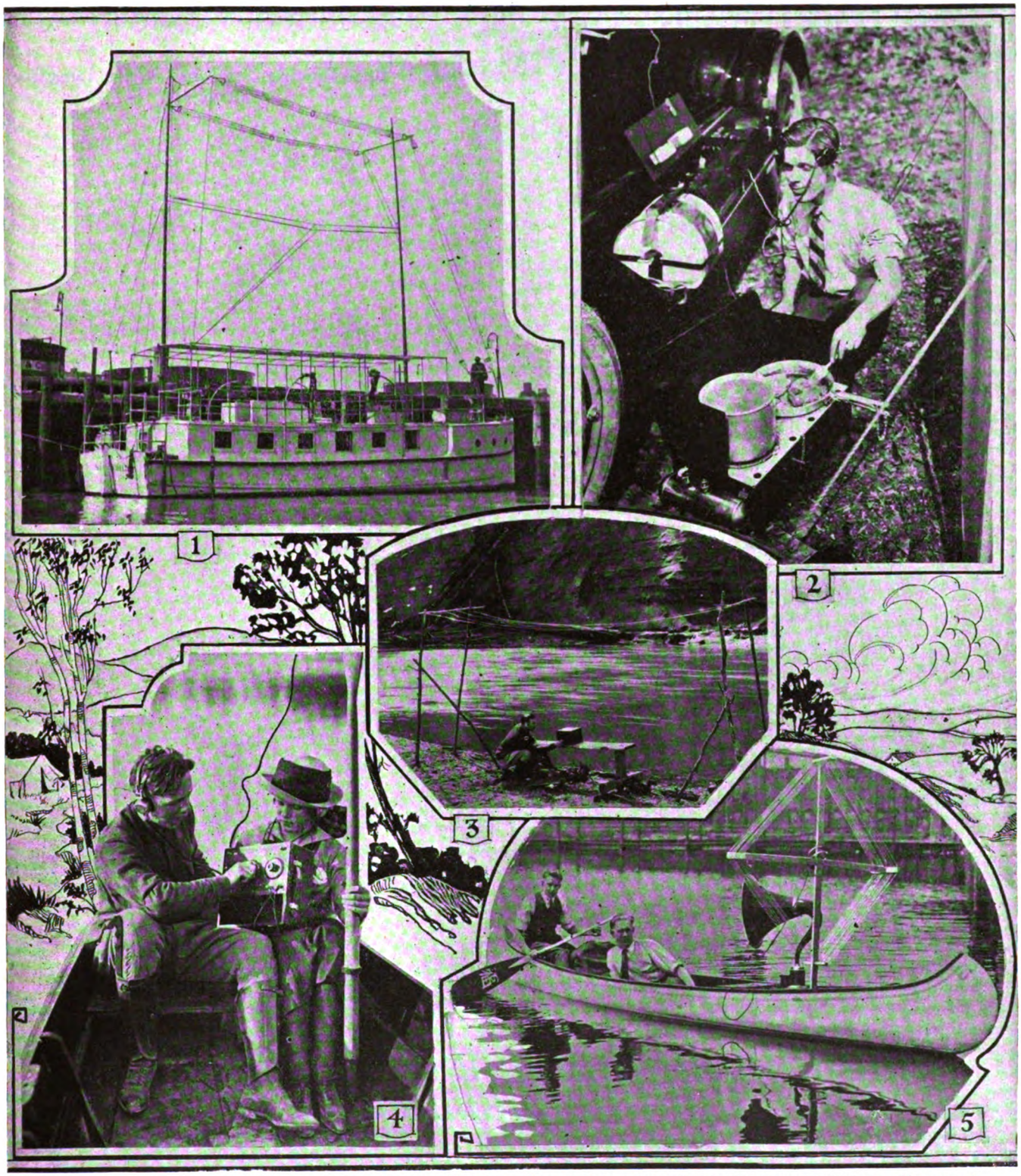
The Infinite Variety of Radio for Summer Pleasure Is Told In These Pictures



(Photographs copyrighted by Underwood and Underwood, Kadel and Herbert, International Newsreel, International Photos, Photonews.)

No. 1. How one staid vacationist is going to be entertained during his trip on a houseboat is plainly visible. He didn't wait for any suggestions, but just went ahead and "did it."

No. 2. What could be finer than some nice bacon and eggs and "You Gotta See Mamma Every Night" over the radio while camping via auto this summer? Beats cabaretting!

No. 3. This is how they do it out in Washington when they go camping along the Green River. Kinda primeval antenna, but it gets KHJ and all the rest, so why worry?

No. 4. Here's a new one, fellas! Use one of your oars to support the loop and bring 'em in fine.

No. 5. It used to be "Give Me the Moonlight, etc." Now it's changed to "Give me my canoe, give me my set, and let the sigs roar in."

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Twenty-two More Class A Stations Licensed This Completes List of Class B Stations

DURING the past week the Department of Commerce licensed 22 more Class A stations and assigned them special zone waves. One of the stations was new, that of Radio Bug Products Co., Kearney, Neb., and the balance were transferred from Class C to Class A.

List of Class A Limited Commercial Broadcasting Stations

Call	Stations	Kcys	Meters	Watts
K F H P	Radio Bug Products Co., (New A), Kearney, Neb.	1220	246	10
W E A I	Cornell University, Ithaca N. Y.	1050	286	500
K F D O	Cutting, H. E., Bozeman, Mont.	1210	248	10
K O P	Detroit Police Dept., Detroit, Mich.	1050	286	500
W C A H	Entrekin Electric Co., Columbus, Ohio	1050	286	100
W W I	Ford Motor Co., Dearborn, Mich.	1100	273	50
K F D P	Hawkeye Radio & Supply Co., Des Moines, Iowa.	1080	278	100
W A A B	Jensen, Valdemar, New Orleans, La.	1120	268	100
W P A Z	Koch, John R., Charleston, W. Va.	1100	273	10
K F B L	Lees Bros., Everett, Wash.	1340	224	10
W D A G	Martin J. Laurence, Amarillo, Texas	1140	263	100
W A A M	Nelson Co., I. R., Newark, N. J.	1140	263	250
W E A M	North Plainfield, Boro. of N. Plainfiele, N. J.	1190	252	50
K J R	Northwest Radio Service Co., Seattle, Wash.	1110	270	100
K F H B	P. L. Boardwell (A. S. Kolstad, the Rialto Theatre), Hood River, Ore.	1070	280	280
K F E P	Radio Equipment Co. (Jos. L. Turre), Denver, Col.	1250	240	10
K F F A	Shelton, Dr. R. O., San Diego, Calif.	1240	242	50
W P A L	Superior Radio & Tel. Co., Columbus, Ohio	1050	286	100
W K A W	United Battery Service Co., Montgomery, Ala.	1330	226	20
W H A G	University of Cincinnati, Cincinnati, Ohio	1350	222	100
W J H	White & Boyer Company, Washington, D. C.	1100	273	50
W B A N	Wireless Phone Corp., Paterson, N. J.	1230	244	100

The official list of Class B Stations with their special waves as announced by the Department of Commerce, May 19, includes 36 regular stations and two special broadcasters.

There were two new stations added to this class recently—the U. S. Playing Card Co., at Cincinnati, WSAI, and the Union Trust Company of Cleveland, WJAX.

Class B Broadcasting Stations—Wave Lengths in Meters

Call	Station	Wave
W E A F	American Tel. & Tel. Co., New York City	492
W G M	Atlanta Constitution, Atlanta, Ga.	429
W S B	Atlanta Journal, Atlanta, Ga.	429
W M A Q	Chicago Daily News, Chicago, Ill.	448
W J A Z	Chicago Radio Laboratory, Chicago, Ill.	448
W M C	Commercial Pub. Co., Memphis, Tenn.	500
W H A S	Courier Journal & Louisville Times, Louisville, Ky.	400
W L A G	Cutting & Washington Radio Corp., Minneapolis, Minn.	417
W F A A	Dallas News and Journal, Dallas, Texas.	476
W C X	Detroit Free Press, Detroit, Mich.	517
W W J	Detroit News, Detroit, Mich.	517
K F I	Earle C. Anthony, Inc., Los Angeles, Calif.	469
W G Y	General Electric Co., Schenectady, N. Y.	380
W I P	Gimbel Bros., Philadelphia, Pa.	509
K P O	Hale Bros., Inc., San Francisco, Calif.	423
W O O	John Wanamaker, Philadelphia, Pa.	509
W D A F	Kansas City Star, Kansas City, Mo.	411
W C A E	Kaufman & Baer Co., Pittsburgh, Pa.	462
W O R	L. Bamberger & Co., Newark, N. J.	405
W D A R	Litt Bros., Philadelphia, Pa.	395
K F D B	Mercantile Trust Co. of California, San Francisco, Calif.	509
W O C	Palmer School of Chiropractic, Davenport, Iowa	484
K G W	Portland Oregonian, Portland, Oregon.	492
K S D	Pulitzer Pub. Co., Post Dispatch, St. Louis, Mo.	546
W J Y	Radio Corp. of America, Aeolian Hall, New York	405
W J Z	Radio Corp. of America, Aeolian Hall, New York	455
W R A Z	Rensselaer Polytechnic Inst., Troy, N. Y.	380
W F I	Strawbridge & Clothier, Philadelphia, Pa.	395
W H B	Sweeney School Co., Kansas City, Mo.	411
K H J	Times Mirror, Los Angeles, Calif.	395
W B A Y	Western Electric Co., New York, N. Y.	492
K Y W	Westinghouse Elect. & Mfg. Co., Chicago, Ill.	345
W B Z	Westinghouse Elect. & Mfg. Co., Springfield, Mass.	337
W B A P	Wortham-Carter Pub. Co., Star Telegram, Fort Worth, Texas	476
W S A I	U. S. Playing Card Co., Cincinnati, Ohio.	309
W J A X	Union Trust Co., Cleveland, Ohio.	390

Specials

N A A	Naval Station, Arlington, Va.	435
K D K A	Westinghouse Elec. Mfg. Co., Pittsburgh, Pa.	326

"Before This Wonder Distance Shrinks"

By Grace Isabel Colbron

Written for the opening of Broadcast Central, the new station at Aeolian Hall, New York

FLINGING free from the guardian wires, into the blue alone,
The human voices goes soaring forth, the simple spoken tone
Bridging the breadth of the sea's expanse, the mountains' cloud-capt height,
Over the fertile prairies broad, the forests' fragrant night.
Calling across from land to land the greetings of friendship go,
With the intimate touch of the spoken word, its warm and human glow.
Before this Wonder the distance shrinks and a listening world draws close,
Its petty envies and hates forgot as the sense of Brotherhood grows.
Before this Wonder the past gleams pale, but the future with promise bright,
For the spoken word on the Radio heralds a New Dawn's light.

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How to Buck the Bugaboo of Summer Static

A Properly Installed Aerial Offers Better Protection Than a Lightning Rod

By Kenneth Malcolm, A. I. R. E.

AS the summer months approach, the embryo radio fan will be introduced to a phenomenon which he may consider entirely unnecessary and unwelcome. It makes itself known as a continuous or interrupted series of cracklings and snappings and is known as "strays," "atmospherics," or more commonly, "static."

Hitherto, static has always been a bugbear to the amateur and commercial operator alike. Its nature was only partly known, and efficient methods for eliminating it or reducing it were not available. Every summer, however, finds new progress and today, with modern developments, for most work it can be eliminated. The broadcast listener need have very little trouble with it, if he will only observe a few precautions.

First, let us look at its nature; and by finding its cause we will be better able to prescribe a remedy.

Dry air is a very good insulator. Clouds are partial conductors. When clouds are blown by the winds over charged earth, or even through supposedly uncharged air, they acquire a charge of electricity of their own, due to friction and induction. If the air is damp and humid this charge tends to leak off, with the result that finally the potential is entirely gone and the earth-cloud system is perfectly balanced.

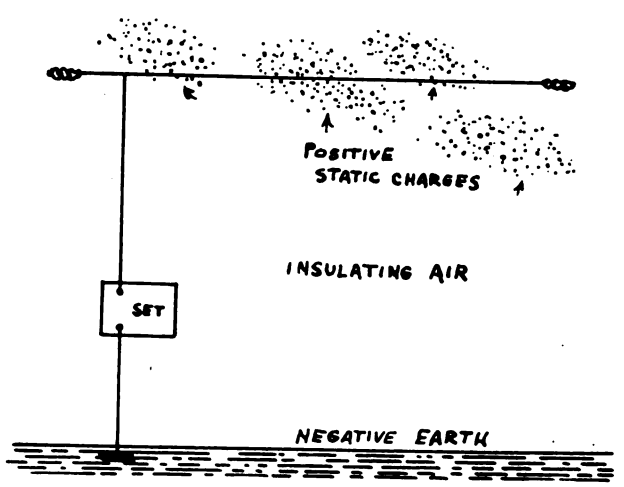
But when the air is dry, the cloud and its surrounding atmosphere retain the charge and possibly increase it. It can't leak off, because there is an almost impenetrable insulator between it and the oppositely charged earth. However, when a cloud comes near to the earth or near to an oppositely charged cloud, and the charge is great enough, the air will be completely disrupted. Such a discharge we see as lightning, and the following crash we call thunder. Lightning generally occurs after the rain has started to fall, for then the resistance of the air is lowest.

Miniature lightning has been produced artificially by Tesla and Steinmetz in their famed high-potential experimental laboratories, the difference being only in the potential. Natural lightning ranges up in the millions and hundreds of millions of volts.

While charges of lightning potential accumulate only in certain widely separated sections, lesser charges are present most of the time. These lesser charges are generally the cause of static. Your aerial is suspended high in the air, and one end, through your set, is grounded. The charges floating in the air find in your aerial an easy means to reach the earth, with the result that you hear them discharging through your set. Sometimes distant lightning discharges propagate waves somewhat similar to the waves sent from a radio station, and this is another cause of the disagreeable noises.

Is an aerial strung over your house a lightning menace? Emphatically not! A properly installed aerial, with a lightning switch or an approved lightning arrester, will offer as much, if not greater, protection as the old-fashioned lightning rod. Communities equipped with many high-strung antennae ought to be perfectly free from any lightning danger. The notion that a little aerial wire would *attract* lightning is absolutely absurd. Metal chimneys, tin roofs, metal leaders, and steel clothes lines could be condemned with greater justification.

Now let us consider the methods that may be used to reduce static so that reception may be enjoyed as much in the summer time as in the winter—let's not pack our sets in camphor balls this season. The first suggestion is that you reduce the height and length of



Diagrammatic representation of atmospheric conditions producing static effects.

your aerial during the summer months—for the nearer the earth, the less static; and the shorter the aerial the less foot-hold it can get. Do this within reasonable limits, however; don't make the aerial so short and so low that reception is impossible with the particular set you have. An aerial about 80 feet long and 20 feet high might be a good size. If this cuts your wave length range down too much, a small loading coil can be added to compensate. If the roof of your house is not of metal, you can string the aerial in your attic, or in the space usually provided between the roof and the ceiling of the top story, with a considerable static reduction.

For those who live in the open country, the ground antenna might be a fit solution to the static problem. Much data has been published on this type of aerial and no more than mention need be given here. It consists, essentially, of heavily insulated wires buried in long shallow troughs in the earth.

The loop is perhaps the most ideal form of static eliminator. The main disadvantage is that with such an aerial reception over any but very short distances must usually be done with the aid of radio-frequency

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Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained in Plain Language for the New Radio Enthusiast

By Lynn Brooks

VARIABLE CONDENSER: It has been found in radio telegraphy and telephony that capacity is a very necessary element in the tuning of a set. Therefore in order to increase the range of such capacitance and increase its usefulness, it has been made variable over a large scale. The variable condensers most commonly used consist of a number of fixed plates, semicircular in shape, and held in place a certain definite space apart, by means of long bolts and washers. Between the spaces of these plates are another set of semicircular plates which are slightly smaller in size, so as to allow them to rotate freely inside the first without touching the washer. The number of plates in such condensers varies from three to as high as 60, depending upon the use to which they are to be put. Their method of variation is to rotate the inner plates. When the plates of the rotor are all intermeshed with the plates of the stationary set, the capacity is at a maximum. As the plates are rotated and more of the surface of the rotating plates is withdrawn the lower the capacity becomes, until when the plates are exactly opposite the capacity is at its minimum. Another and quite common form of variable condenser is that using the surface of two large plates. One of them is stationary and the second can increase or decrease the distance between the flat surface of both by means of a very fine machine screw. In order to prevent short circuiting, it is generally the custom to insulate one of the plates by means of a very thin sheet of mica, or coating one of the plates with some other thin insulating compound. As the distance between these two plates is varied the capacity is accordingly varied. The closer the plates the higher the capacity, and the maximum is reached when there is no air space between the two, and only the thin insulator is separating them.

FIXED CONDENSER: In many places in a circuit it is necessary to use capacity, but because of the fact that the capacity does not need to vary a fixed condenser is used. A fixed condenser is one whose construction does not permit of variance. It is generally made of a number of metallic plates separated by a suitable dielectric. These plates are of fixed size and arranged in a pile, one on top of the other, and with a suitable binder to hold them together. The determining factors in such a condenser are the number of plates, the thickness of the dielectric, the total area of plate surface on one side and the dielectric constant for the particular insulating media used.

GRID LEAK: As we have before stated, the grid in a vacuum tube acts as a gate to let the negative electrons pass, or hold them back, depending upon the condition of the grid. As the polarity of the grid has to change, some method of allowing the negative electrons to pass off around the condenser must be had. To do this what is known as a grid leak is provided. This is a very high resistance (non-inductive) over which the electrons can pass when sufficient have accumulated and done their work on the grid. Numerous methods of making a grid leak are found. The commonest is to soak a piece of paper or cardboard in India ink, letting it dry and then placing it in the circuit. Other methods consist of making a pencil mark on paper and using that, or using graphite in the form of a paste in a tube. In most of the tubes used at the present time, the conditions call for a variable grid leak for the proper manipulation of the tube. In the pencil mark type this is accomplished by erasing the lines or making them heavier. In the India ink type it is accomplished by either lengthening or shortening the paper, or using a slider for one end of the contact.

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amplification. However, with some of the new super-regenerative and reflex circuits this trouble may to a large extent be done away with. Within 15 or 20 miles a loop may be used with even a plain single tube regenerative set.

The simplest loop set can be made by connecting the loop terminals at the point where the terminals of the secondary of a variocoupler would be placed in the regular three-circuit regenerative set. A vernier variable condenser is used for the tuning. Such an arrangement offers great selectivity as well as freedom from static, and will work well over moderate distances.

The single tube super-regenerator is quite good for loop reception and, on account of its greater ease of control, the single tube reflex circuit is a trifle better. These two types are dandy for portable sets, in connection with dry cell tubes.

Of course, the regular radio-frequency amplification sets may be used with positive results. They are both very dependable and selective. For those who can afford them they are the best buy. Use one, two, three, or as many stages as you need to cover your distance. The two and three tube "super" and reflex sets are not to be forgotten.

If you use a regular crystal or vacuum tube circuit, with a regular aerial, you may reduce static considerably by avoiding series condensers. These tend to store the energy and discharge at the most inopportune times. Reducing the coupling between the coils of your variocoupler or variable condenser may help considerably. Static charges are not as willing as radio waves to jump between coils that are magnetically coupled.

A number of balanced tuners and balanced aerials have been devised from time to time, and with more or less success, but they are of interest to the commercial operator and engineer more than to the broadcast listener, because of their complexity and comparative cost.

Static is more than a nuisance; it is a fiend that costs the radio companies millions of dollars annually.

Why is it that an amateur can span the Atlantic with 100 watts, whereas the big trans-Atlantic commercial stations fling out an energy 2,000 times this amount? And an amateur's aerial can be a measly 100 feet, while the commercial giant must have an aerial of five miles? The answer is simply "static!" When the amateurs and the broadcasting stations get across, the air is most free from this pest. But commercial stations must carry on continuous service, with the result that they must bang and batter their way through the static barrier—and at an expense of hundreds of times the energy that would otherwise be required. A satisfactory solution to this problem means a fortune to the inventor.

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR BUSY READERS

Sir Samuel Hoare, Air Minister of Great Britain, was informed of the appointment of Stanley Baldwin as Premier by wireless telephone as he was on his way by airplane from London to Cologne.

* * *

The Minneapolis Journal not long ago announced a need of $5,000 for a radio fund for the unfortunate patients of the Glenlake Tuberculosis Sanitarium. In three days over 1,000 persons voluntarily sent $7,741 to the Journal.

* * *

A. Frederick Collins, author of a number of scientific works and several books on wireless telegraphy, has been elected a Fellow of the Royal Astronomical Society and a member of the Radio Society of Great Britain.

* * *

Dr. Samuel Wesley Stratton, formerly Director of the Bureau of Standards at Washington, D. C., will be inaugurated as President of the Massachusetts Institute of Technology in Symphony Hall, Boston, on the morning of June 11.

* * *

Engineering extension courses by radio may be established at Pennsylvania State College. The engineering extension department, Dean Sackett is quoted as saying, already reaches 9,000 industrial employees each year, with class and home study courses.

* * *

Georges De Launay, a well-known pianist and conductor of the Paris Orchestra, recently made a formal protest against the installation of a wireless telephone transmitter in the concert hall where he was to play and refused to begin the concert if it was used.

* * *

Guynemer Post of the American Legion, of New York, composed of veterans of the air and radio services, claims to have been the first post to broadcast its meeting announcements by radio. This was done in 1919 before there were any commercial broadcasting stations.

* * *

The naval radio station established at Cape May, N. J., during the war has been dismantled and the equipment will be installed at Lewes, Del. The naval radio compass station at Cape May will remain there, but hereafter all naval vessels will flash their radios to the new station.

Radio signals are believed by some scientists to travel forever in the infinite. If this is true, the signals made in Marconi's original experiments are still on their way following those generated earlier by Tesla and others.

* * *

Wireless broadcasting of religious services should be confined to week-days so that Sunday may be left for public worship, according to an address delivered at Minneapolis, Minn., by the Rev. Phillips E. Osgood, rector of St. Mark's Protestant Episcopal Church.

* * *

Harris J. Ryan, professor of electrical engineering at Stanford University, California, was elected president of the American Institute of Electrical Engineers at the recent annual business meeting held in New York City. The total membership of the institute on April 30 was 15,298.

* * *

Kurt Hildesheimer informs RADIO WORLD that a few weeks ago the first German amateur radio club was organized in Berlin. It will devote its energies to popularizing radio. The address is Deutsche Radio Club, Berlin C2, An der Stechbahn 1, Germany. Mr. Hildeheimer writes: "Let us hope that the international science of broadcasting will help overcome some of the artificial barriers between the world's nations."

* * *

Edward J. Nally, managing director of International Relations for the Radio Corporation of America, returned last week from a trip to South America and reported that the construction of the huge wireless sending station a few miles south of Buenos Aires will place South America in touch with the entire world. He said that the new station would be completed in August and other stations would then be constructed at Rio de Janeiro and Pernambuco.

* * *

The Eiffel Tower wireless transmitting station in Paris was put out of commission by lightning one day recently, when a bolt struck the antennae, 1,000 feet above ground, and the entire apparatus crashed to earth. While rush repairs were being made the station was silent and thousands of radio fans missed their daily broadcasting program and evening concert as well as the time signal which is given every noon. Another wireless station near Tours substituted part of the time for the Eiffel Tower station.

Schedule of Standard Wave Length Tests from Station 1XM

STATION 1XM, at the Massachusetts Institute of Technology, Cambridge, Mass., will broadcast standard wave length test signals at the hours and dates enumerated in the schedule below. The time used is Eastern daylight saving time. Eastern amateurs and station operators are thus afforded an unusual opportunity to calibrate their wave meters and sets.

The schedule follows:

Time	Wave Lengths in Meters	
P. M.	June 4	June 11
7 00	220	380
7 05	210	360
7 10	200	340
7 15	190	320
7 20	180	300
7 25	170	280
7 30	160	260
7 35	150	240
7 40	140	220
7 45	130	...
7 50	120	...
7 55	110	...
10 00	...	110
10 05	...	100
10 10	...	90
10 15	...	80
10 20	...	70
10 25	...	60
10 30	...	50
10 35	...	40

During the first minute of each five the wave will be announced in code. During the next two minutes the wave will be indicated by dashes corresponding to the figures; that is, 320 meters will be indicated by three dashes, two dashes and one long dash; 380 will be indicated by three dashes, eight dashes, and one long dash, and so on down the scale.

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Directions for Building a Portable Loop for Summer Portage

By Arthur G. Shirt

GOING camping this summer? Canoeing? Or cruising up the coast to Maine or down it to Miami? Going to take a radio along? If so, you'll need a portable antenna that will fold up like an army cot, that will fit under your arm, across your back, in your canoe and that, when unfolded, will bring in the broadcasters from seven states, with the minimum of interference and atmospherics. You'll need something that, notwithstanding its collapsible nature, is strong and sturdy, so that it will stand the rough usage of the camp and country. A loop, for instance, designed especially for vacation use by an expert in loop construction—one that you can make yourself, that doesn't cost a fortune to build, and so on.

Making a loop is not as easy as it looks. Amateurs who have tried it know the unstable botch that results when certain vulnerable spots in frame construction have been neglected. The particular difficulties in making a portable loop are first of all, to make it a practical asset to the receiving set and not an irritable annoyance; then to make it so that its component parts fit as well when spread out for reception as they do when folded for portage. If the plans given herewith are followed reasonably close, the above-mentioned difficulties will be smoothed out with no trouble at all.

Procure a strip of light wood ¾-inch thick, 1½

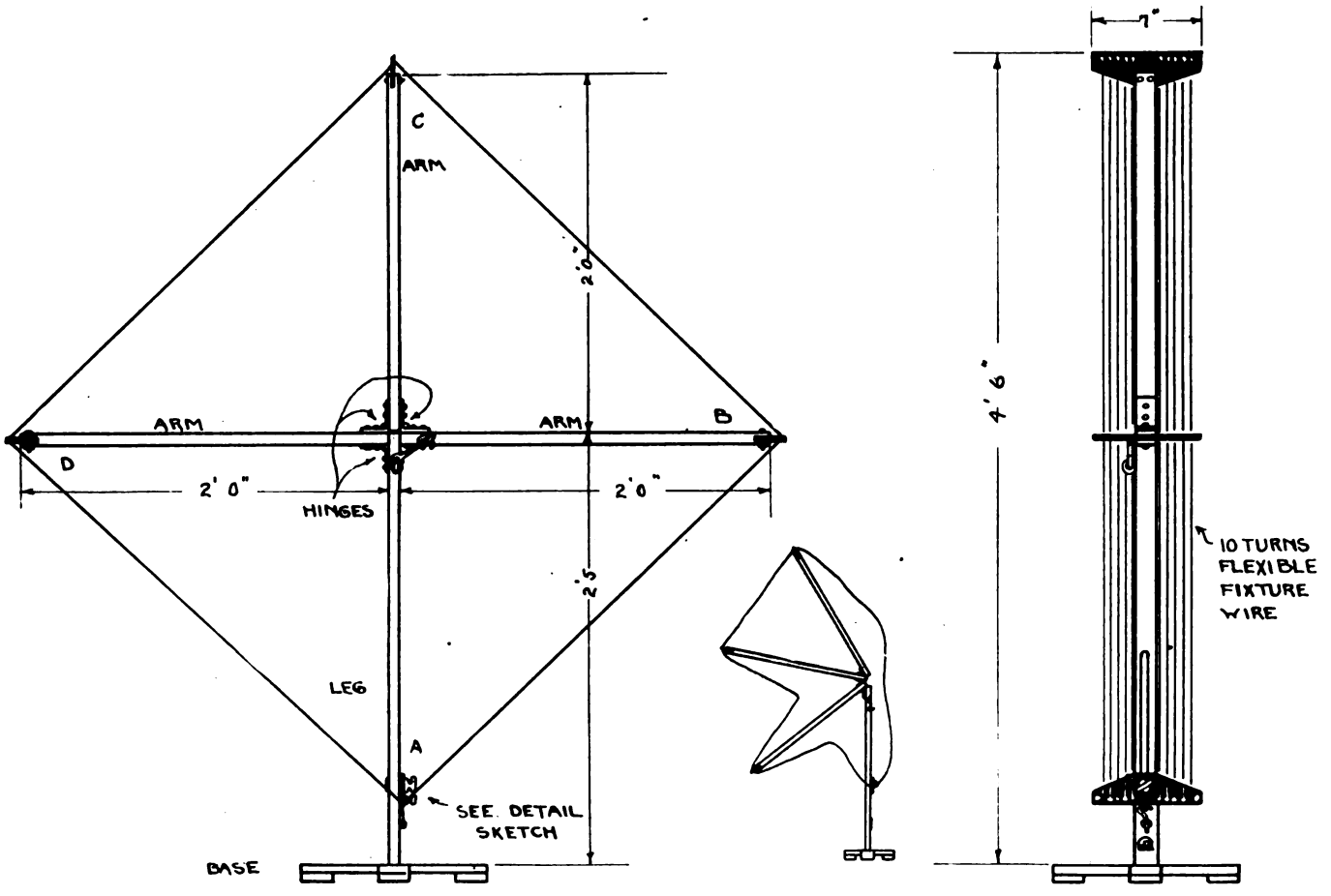

Fig. 1—The assembly of the collapsible loop. It has ten turns of No. 18 flexible fixture wire and folds in the manner shown in the smaller sketch.

Well, here it is. The folding loop antenna described and illustrated in this article is just what you are looking for. When closed, it fits neatly into a canvas bag, and can be carried on canoe and hiking trips with no trouble at all. When open for business, it is in no way inferior to an outside aerial; in fact, if the set with which it is used is a single tube super-regenerator, or a single or multitube reflex circuit, it is actually preferable. When used in a circuit which employs a variable condenser to control the wave length, it is suitable for broadcast reception over the entire range of wave lengths now allocated to broadcast work. It is directional, of course, but not extremely so, and this loose characteristic makes it ideal for small pleasure boats, whose unsteady veerings would otherwise interfere with continuous reception.

inches wide and nine feet long. White wood is recommended, but if this is not obtainable, any soft and not too heavy wood will do. Soft wood is used because of the ease with which it is worked. Saw the nine-foot strip into four pieces, one 2½ feet long and three others two feet long. The longest piece of wood is the leg of the loop frame, to which the base is fastened and on which the other three lengths, called arms, revolve.

Riveted to the end of each arm is a spreader made of hard rubber, fibre, or any other good insulating material. Wood will do, provided it is ash or oak; otherwise a wooden spreader is very apt to split when subjected to the strain of repeated collapses while the loop

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is in use. These three spreaders are immovable. There is a sliding spreader, however, attached to the leg, and this has its peculiar use in slackening the turns whenever the loop is to be folded.

The hardware needed in constructing this portable loop consists of three suitable hinges, two hooks and eyes, a thumb screw, a number of copper rivets, six 8/32-inch brass bolts, a ¼-inch bolt with washers and nuts, and two brass or copper plates one inch square. The use and place of all this material is apparent from a study of Fig. 1, which is an assembly view of the completed antenna, but they will be mentioned again in detail as the description progresses.

The four spreaders are all of the same dimensions, two inches wide by seven inches long. The fixed spreaders are mortised into the end of the three arms, and are fastened there by two 8/32 brass bolts. (See Fig. 2.) Ten holes are drilled in each spreader, five on each side of the frame arm. The first hole is drilled ½-inch from each end, and the others at ½-inch intervals. These holes should be large enough to take the wire used in winding the loop, which in this case is No. 18 flexible fixture wire, braid insulated.

The details of the movable spreader are given in Fig. 3. Like the fixed spreaders, it has ten holes spaced ½-inch apart, and in addition, two others to take the two binding posts needed. On its lower edge it has a small eyebolt by which it can be hooked down into place. The slot in which the spreader slides up and down is ⅜ of an inch wide, and is cut in the wide face of the leg from just above the hook to a point 14 inches high. A thumb screw guides the motion of the spreader in this slot and also tightens it wherever needed.

The leg is fastened to the base by a ¼-inch bolt inserted up through the base and into the end of the leg. A hole is drilled and its lower half flattened out, so as to permit a wrench grip on the nut while tightening up. The base itself is merely two strips of wood dovetailed at the center and fitted with blocks two inches square at the ends.

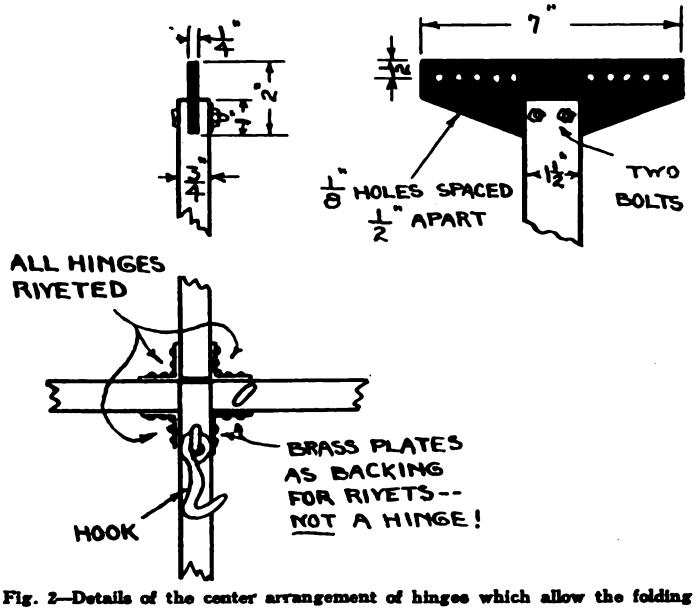

Fig. 2—Details of the center arrangement of hinges which allow the folding of the arms.

When the leg and arms are ready for assembly, hinge them together at the center as shown in Fig. 2. This is the most important detail of the whole job, for most of the loop's sturdiness depends upon the thoroughness with which the center arrangement of three hinges and one hook is carried out. The hinges should be riveted and not screwed to the ends of the arms. Where there is no metallic backing for the rivets, supply the brass plates as shown. The leg should project beyond so that its end is on a level with the upper sides of the cross arms. This allows the leg to act as a check upon the hinges. The hook is to hold the three arms in place after they are spread out.

The loop is wound with 10 turns of No. 18 insulated fixture wire. Fixture wire is flexible and therefore is readily adaptable to the needs of a folding loop. To wind properly, unhook the movable spreader from its final position and make it fast about one inch above that position. Take one end of the fixture wire through the first hole, connect that end to a binding post and wind the other around the loop, taking the entire amount of wire through each hole in turn. This takes some time and patience, but when finished, has its advantages, especially in this case, where the collapsible

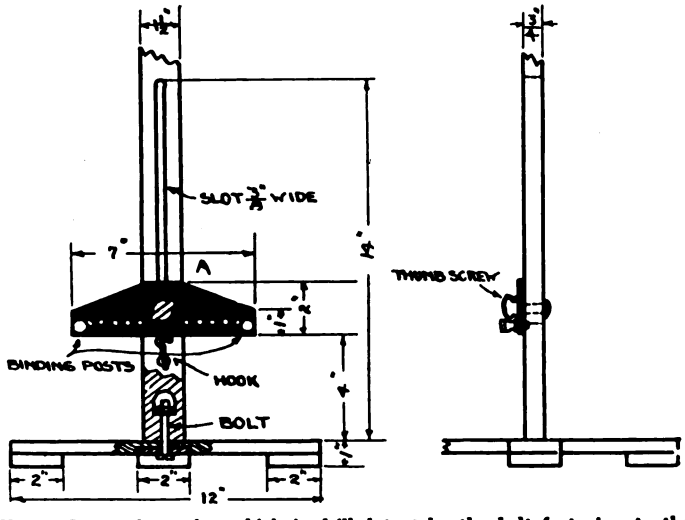

Fig. 3—Lower frame leg which is drilled to take the bolt fastening to the base. It is slotted so that the spreader can be moved up and down as required.

feature is so important. Connect the end of the last turn to the second binding post, and as you force the movable spreader to its hook again, you take all the slack out of the turns and the result is a very neat and attractive solenoid loop.

At this stage of the construction, try to fold up the antenna, and you will discover at once the reason why the lower spreader is movable. The turns must be slackened up considerably before arm B will swing alongside arm C, and this slackening is done by raising the movable spreader. The loop is folded as indicated in the small sketch in Fig. 1, and a leather strap is put around the four lengths to keep them together.

The particular loop described is somewhat of an antenna. It stands 4½ feet high and takes 120 feet of wire. With it, a single tube set can be operated satisfactorily for local and moderately distant work, but if the amateur is thinking of taking along a three or four tube set, either standard or special circuit, the loop can be cut down to half the size. In such case, of course, the features of the construction would be in no way altered.

The Radio Wise Man

THERE is a man in our town and he is wondrous wise;
He sits before a knobby box and pulls music from the skies;
He fools around with wires and tubes and other funny things,
And when he gets quite through with it—dad blame it all, it sings!

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A Fine Portable One Tube Reflex Set

By W. S. Thompson, E. E.

WHEN spring arrives and summer is near at hand, there are always some "old-timers" who advise the radio fan to put aside his receiver until the cold weather again puts in an appearance. This advice, although well meant in the majority of cases, leaves a wrong impression with the inexperienced. Reception during the summer is not equal to that during the winter but there is no reason for setting aside the pleasure of tuning in stations just because the atmosphere is not absolutely clear of noises. In fact, the writer believes, the summer is the time to get the greatest pleasure out of radio. Imagine yourself floating along in a canoe and carrying with you a complete receiving set to supply music suitable for the occasion. And again, it is in the summer that we usually lack amusement in the form of plays, opera, etc., for their season is in the winter. In the summer one goes on a vacation back on the farm, to the mountains or to some other place which usually does not have very many facilities for amusement during the evenings. Then it is that the radio set comes into its own.

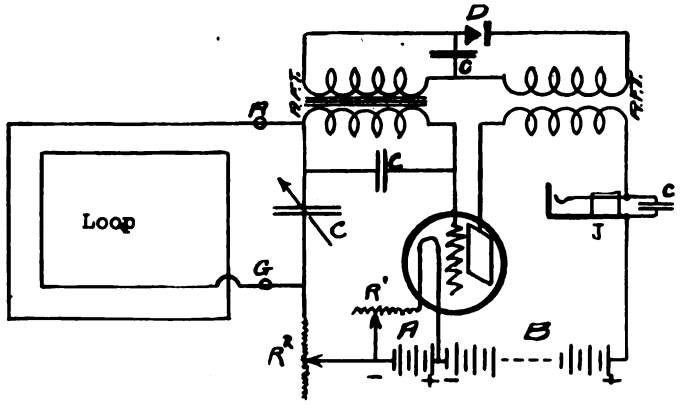

Fig. 1. Single tube reflex circuit used in the compact receiver. With a sensitive crystal detector this circuit is equivalent to a three tube set.

For summer reception there are several pointers regarding antennae to be kept in mind if the best reception is desired. Atmospherics are, of course, the biggest obstacle to overcome, but if one uses a loop or a short, low antenna such as can be put up in a half-hour or so, reception can be made remarkably clear. For an antenna a single wire 50 feet long stretched from the top of a tree to one's camp or house will serve remarkably well. A loop, such as described herein, can also be used and carried about with very little difficulty.

A few years ago when dry cell tubes could not be obtained, the vacationer usually left his radio set behind unless he owned a truck to take the necessary storage battery and plate batteries with him. However, today there are several tubes on the market which require only one dry cell for filament lighting so there is no reason for leaving a receiver behind because a storage battery is unhandy. The dry cell tubes are very efficient detectors and amplifiers, and can be depended upon to give just as fine reception as the larger tubes, so any one contemplating building the set described below may feel sure that he will have a really fine one tube portable receiver.

One of the most popular circuits which has recently been called to the attention of the public is the one tube reflex. This is a remarkable circuit and gives wonderful reception over long distances. Due to these fine qualities the writer has incorporated it into a very convenient outfit which ought to enable any experimenter to have music wherever he goes. Fig. 1 shows the wiring diagram for this portable set connected to a loop. The parts are lettered and are as follows: C—Three mica condensers 0.002 mfd.; C1—Variable air condenser 0.0005 mfd.; R1—Filament rheostat; R2—Potentiometer 400 ohms; J—Jack for phones; D—Crystal detector (synthetic); A-B—Batteries.

The potentiometer should be non-inductive such as the carbon pile type which is on the market. A wire potentiometer usually has its turns wound in the form of a coil so that any adjustment will change the inductance of any circuit in which it is connected. This is undesirable because it requires a readjustment of the tuning control. The purpose of the potentiometer is to suppress oscillations. After a station has been tuned in the potentiometer is adjusted much the same as the tickler coil of the regenerative receivers; that is, until the signal strength is maximum without distortion.

The crystal detector D is specified synthetic because there are some crystals sold today which are sensitive all over their surface so that there is no necessity for critical adjustments trying to find a sensitive spot. Due to this fact a permanent setting can be made and not be again touched for quite a while, depending upon the care with which the set is handled. The parts of the circuit marked A and G should be connected to a jack so that the loop may have its leads connected to the set by plugging in this jack. By this means attaching the loop may be made very convenient and allows for connecting an antenna and a ground to the circuit. If an antenna is handy or if the builder puts one up, it can be plugged in the same as the loop, providing a separate inductance has been hooked in series. This inductance may be a honeycomb coil, a variometer or any form of inductance. A honeycomb coil can very easily be carried in the case for there is ample room for one or two.

Fig. 2 shows the front view of the set when the hinged cover is open. The casing can very easily be made by anyone handy with carpenter's tools for the joints do not have to be dovetailed nor does the set have to look pretty. If care is taken to sandpaper well before varnishing, the casing will give a neat appearance, even though it is not made by a cabinet maker. As will be noted from the dimensions given, the wood specified throughout is ¼-inch thick, so the dimensions will hold only if this size is used. The cover is hinged to the cabinet by two small inexpensive brass hinges which can be purchased at any hardware store. Inside this cover is a handy place for maps and other papers the vacationer may carry. Ample space has been allowed for four small size B batteries, although this number is not absolutely necessary. By cutting the number down to two or three, a couple of honeycomb coils may be carried in order to increase the wave length range of the set, although, as it stands, all the broadcasters may be tuned in. The phones may be carried in a space provided for them so that every item necessary for reception can go with the set.

Fig. 3 is a top view of the set, giving some idea of the arrangement of the parts back of the panel. The parts are all lettered to correspond to the lettering of Fig. 1, making it difficult to go wrong in the wiring.

(*Continued on next page*)

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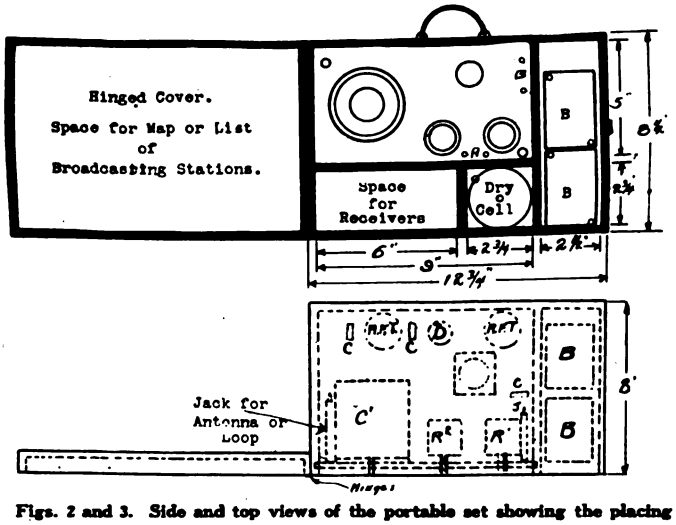
In constructing the set a hinged door should be made over the tube socket to allow replacing of burnt out tubes or an adjustment of the detector D. This door may be just large enough to allow the hand to go in, but the whole top may be hinged if so desired. In any event, a catch of some kind will have to be made to keep this door shut. A hook which fastens over a small brass screw will do very well for both this door and for the hinged cover. The condensers C are held in place by the wiring so that no special mounting is necessary. When building the set the panel and the partition below it should be left out until the last of the assembly. The partition acts as the base for the apparatus so that all the wiring and assembling can be done on the panel and the base before placing in the casing. After the assembling has been done, the panel and the base should be put into place and fastened there with brass screws. All the joints of the case should be made using brass screws, thus making a very neat appearing job.

Fig. 4 shows a loop which may be carried with the set for it can be folded up and removed from the base. No dimensions are given on the drawing for they will depend upon the size loop the builder wishes to make. The square formed by the wires should not be less than eighteen inches for good reception and not more than thirty-six inches for good portability. A very convenient and efficient loop may be made by having the cross pieces eighteen and nineteen inches long, the longer one being vertical. The cross pieces may be made from one-half inch by one-half inch wood, being sure that it is hard and well seasoned. The bottom of the vertical piece should be rounded and fitted snugly into a hole in the base, allowing the removal of the base at any time. A good base may be made from a piece of wood seven inches square by one inch thick,



Figs. 2 and 3. Side and top views of the portable set showing the placing of all apparatus. A set similar to this can easily be taken anywhere you go, as it is self-contained.

drilling a one-half inch hole in the center for the loop standard. At the point where the two cross pieces intersect, each should be sawed half way through one-half inch apart, as shown in Fig. 4. This allows the two pieces to cross and still have their sides flush. They should be held together with a small brass bolt with a wing nut. The wires are held in slots cut at the ends of each cross piece one-fourth inch apart and slanting towards the center. As shown in Fig. 4, the slots should be cut just deep enough so that there is no chance of the wires coming loose when the loop is in use. For the size loop specified, eighteen turns of wire will allow the set to tune in all broadcasting stations except some of those operated by the government.

When the parts of the loop are finished, they should be assembled and the wire wound in the slots, fastening each end to the bottom of the vertical cross piece. These two leads may then be attached to a telephone cord and the cord to the plug which goes into the loop jack of the set. To carry the loop all that is necessary is to remove the bolt at the center, spring the two cross pieces apart and then turn them until they are parallel, making a convenient bundle. During this turning process, the wires are very liable to come loose

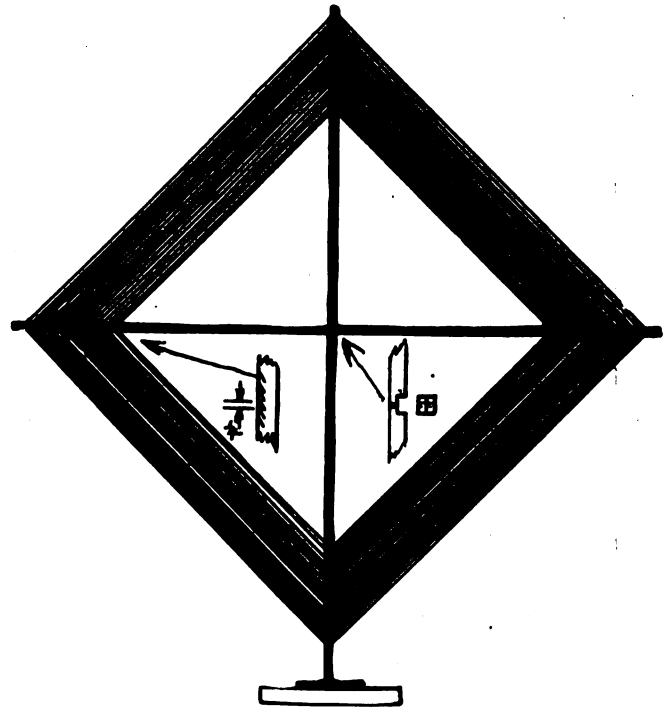


Fig. 4. Collapsible loop used with the portable receiver.

from the slots so a thin piece of insulating material should be fastened over them, preventing any wires from slipping out. Precaution must be taken to prevent the wires from tangling up and kinking. If a stranded cable is used, this difficulty is avoided because the wires may be tied firmly to the rods without danger of permanent kinks.

With this set one may have entertainment this summer, no matter where one may be, and it is the hope of the writer that nobody will find it too much trouble to build.

Get the
BASEBALL SCORES ALL SUMMER
Take a Radio Set along with you.

Coming! New List of Broadcasters!

While the Department of Commerce has assigned wave lengths for each of the broadcasting zones established by the recent Second National Radio Conference, individual assignments of station wave lengths have not been completed. They are being allocated as rapidly as possible and as soon as finished A COMPLETE, UP-TO-DATE LIST OF BROADCASTERS will be published by RADIO WORLD.

The allocation of wave lengths for new groups of stations appears in this issue of RADIO WORLD.

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Radio Completes the Pleasu

Captions by Rob

(Photos Copyrighted by Fotograms, N. Y.; Kadel & Herbert; Underwood & Underwood; Wide World Photos.)

No. 1. The vacation radio spirit in London. This young radio enthusiast, leaving London for the season, determined to take his set along and get 2LO all summer. Atta boy!

No. 2. When you take wifie fishing, carry along your radio set. This will give you a chance to catch some fish and keep wifie busy.

No. 3. What could be sweeter than sitting on the lawn in a nice comfy chair and bathing suit listening to WJY play some good jazz like this young lady is doing?

No. 4. Doesn't this make you hungry for the beach? When you go, take along your set and give the girls something to listen to besides "What Are the Wild Waves Saying?"

No. 5. While hubby goes for gas, you can be listening in, if you prevail upon him to install a nice loop set like this one has done. It doesn't take up space, and think of the comfort.

No. 6. Sometimes the fish don't feel like nibbling, so you have to wait. While waiting why not listen to some good radio concert?

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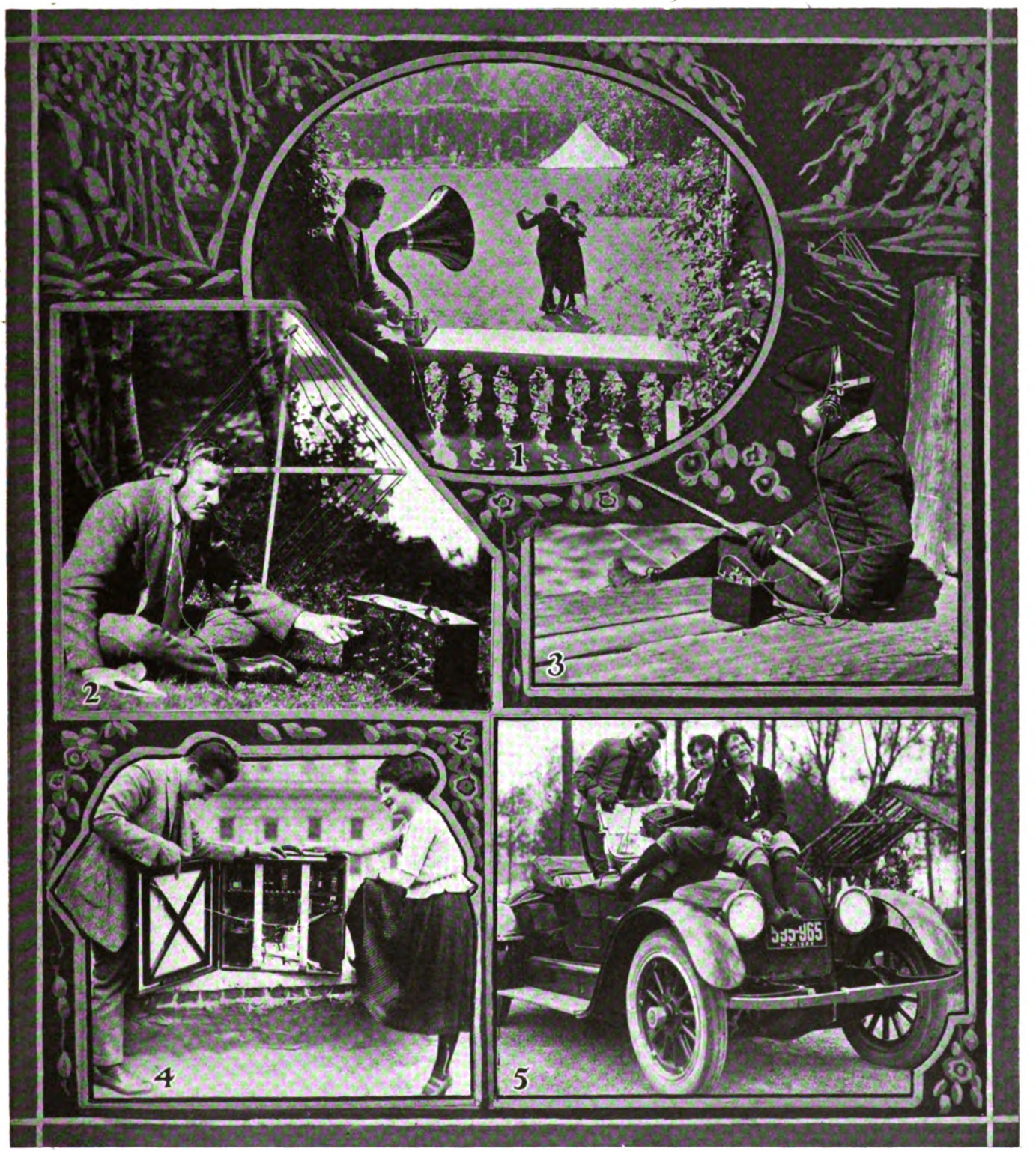
ures of the Great Outdoors

ert L. Dougherty



(Photos Copyrighted by Wide World Photos; Kadel & Herbert; Fotograms, N. Y.; Westinghouse Elec. & Mfg. Co.)

No. 1. Take along your set and be assured of your favorite dance orchestra, whether it be Isham Jones, or Vaughn de Leath's Original Radio Boys.

No. 2. Camping in the Maine Woods with radio. Plenty of chance to use it up there, especially when you like to get an advance slant on the weather.

No. 3. Here's one fisherman who isn't going to be bored waiting for bites. A wire strung around the dock serves as an antenna, while a tin can on a wire is a good ground. Try that on your patience.

No. 4. Just ready for the trip—all equipped with their suitcase loop set, which is self-contained. It has three bulbs, too, and make believe they won't get distance way up in the mountains!

No. 5. If you are only going week-ending with the old bus, take your radio and enjoy the woods to the tune of Chopin's Etude in E minor. It's also a great help when a shoe goes—especially for the women, because waiting is so tiresome.

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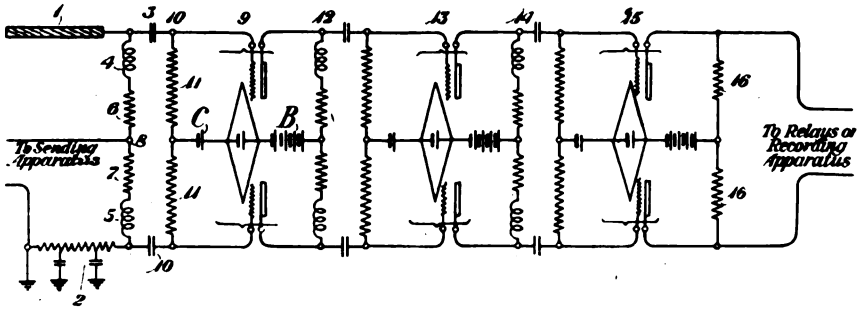
Latest Radio Patents

Receiving Circuits for Weak Signal Currents

No. 1,450,980: Patented April 10, 1923. Patentee: John R. Carson, New York City.

This invention relates to signal transmitting systems and is concerned especially with the receiving end of transmission lines in which there is a considerable amount of distortion and attenuation, the original form of the current impulses though adding to the attenuation, and then to amplify the faint but corrected impulses by an amplifier of the thermionic type in which large amplification, without substantial distortion, can be secured. It has also been proposed to connect



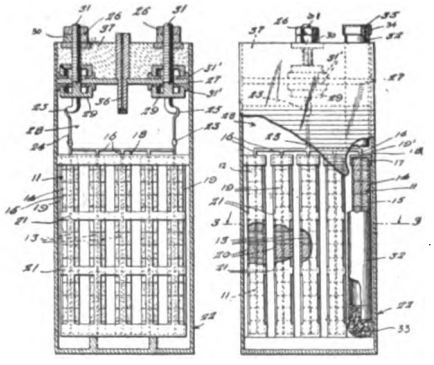
John R. Carson's method of boosting weak currents in retransmitting signals.

as in long submarine cables. It is well known that in signaling over lines of the character mentioned, the speed is very limited because of the characteristics of the line and many efforts have been made to overcome this difficulty. It has recently been proposed to combine with circuits of this sort correcting networks which restore, to a considerable extent, correcting networks and amplifiers alternately in the circuit so that both the correcting and amplifying are done in successive stages. By this means impoved results are obtainable. It is the object of the present invention to provide an efficient circuit of this type suitable for duplex operation. The principle involved can be applied to radio or line work.

Storage Battery

No. 1,451,347: Patented April 10, 1923. Patentee: William H. Thorpe, Mount Vernon, N. Y.

This invention relates to small storage batteries and its object is to provide a comparatively inexpensive storage battery suitable for delivering small current outputs, but having a large ampere-hour capacity for a given weight of active material, a minimum amount of local action and a reasonable length of life, that is,



Battery delivering small current out-put but having large ampere-hour capacity.

cycles of charge and discharge, and a minimum amount of deterioration while standing idle. Also included in this invention is an improved method of filling the battery with water or electrolyte and an improved method for the prevention of terminal corrosion.

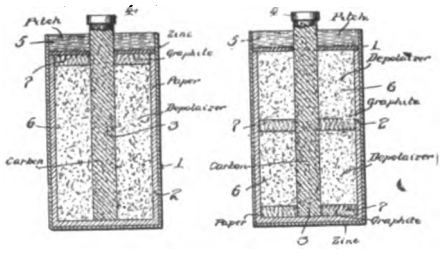
I have herein described one embodiment of my invention which is the best of which I am at present advised, but this embodiment is used in an illustrative sense and not a limiting one for obviously many embodiments can be devised which will be within the spirit and scope of the invention.

High-Power Dry Battery

No. 1,452,230: Patented April 17, 1923. Patentee: Alfred A. Wells, Montclair, N. J.

This invention relates to dry batteries and relates especially to batteries of the Leclanche type composed of a zinc cup having a central carbon pencil or electrode surrounded by a depolarizing mass of carbon and manganese dioxide, but the invention is not wholly restricted to the particular type of battery herein described for illustrative purposes.

In the present invention it is the object to produce a battery having a high amperage or current output and also in some cases to secure a higher voltage.



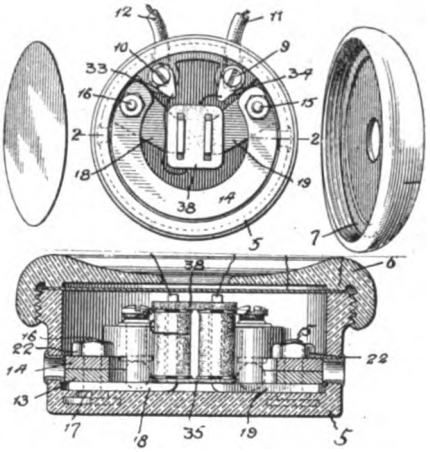
New method of constructing a high power dry cell.

The invention as carried out in its preferred form involves the introduction into some portion of the depolarizing mass of a layer or restricted zone of graphite, carbon or similar conducting material, preferably without any manganese dioxide or other depolarizing agent present (although the latter may be introduced in case the conductivity is not materially affected). The restricted zone of conducting material, which will be hereinafter referred to for illustrative purposes, simply as graphite, may be a layer thereof one-eighth to one-fourth inch or more in thickness, preferably extending from the carbon electrode or pencil to the paper, cloth or other insulating material present between the depolarizing mass and the zinc container. Preferably the layer of graphite is placed over the depolarizing mass and is securely tamped in place, but it is also possible to have such layer in the middle or at the bottom, or elsewhere, in the depolarizing mass. Delaminated graphite is especially useful for the purpose and although of a bulky character, on pressure it packs to a dense mass, appearing almost like a solid block of graphite, and this material fills in compactly around the carbon pencil, making a continuous conducting mass between the latter and the zinc electrode.

Telephone Receiver

No. 1,452,334: Patented April 17, 1923. Patentee: Charles T. Baisley, North Edgecomb, Maine.

This invention relates to telephone receivers, and particularly to receivers of the watch-case type. The particular ob-



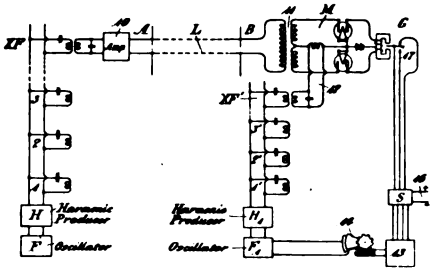
Improved method of constructing a telephone receiver.

ject of my invention is to provide a receiving magnet unit of improved construction which facilitates its manufacture and its assembly with the related elements of the receiver.

Synchronizing System

No. 1,450,966: Patented April 10, 1923. Patentee: Herman A. Affel, Brooklyn, N. Y.

This invention relates to means for producing synchronism and isochronism between the alternating currents supplied



Means of syncronizing alternating currents independently supplied.

from independent sources. One of the features of the invention resides in the provision of means whereby the current supplied from one alternating current source may be automatically maintained at the same frequency and in the same phase relation with respect to currents supplied from another source. Another feature of the invention resides in the provision of means whereby the frequency and phase angle of a locally supplied alternating current adapted to be used in connection with the production of carrier frequencies for a multiplex system may be maintained.

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THINK of your Radio receiving set as a kind of camera whose "film" is sensitive to *sound* waves instead of *light*.

Developing this "film" into real "sound pictures" is the whole art of Radio usefulness and enjoyment.

For this, no apparatus has ever been evolved which gives results equal to those produced by Magnavox Equipment.

R2 Magnavox Radio
(With 18-inch horn)

This instrument is intended for those who wish the utmost in amplifying power; for clubs, hotels, dance halls, large audiences, etc. It requires only .6 of an ampere for the field. Price **$60.00**

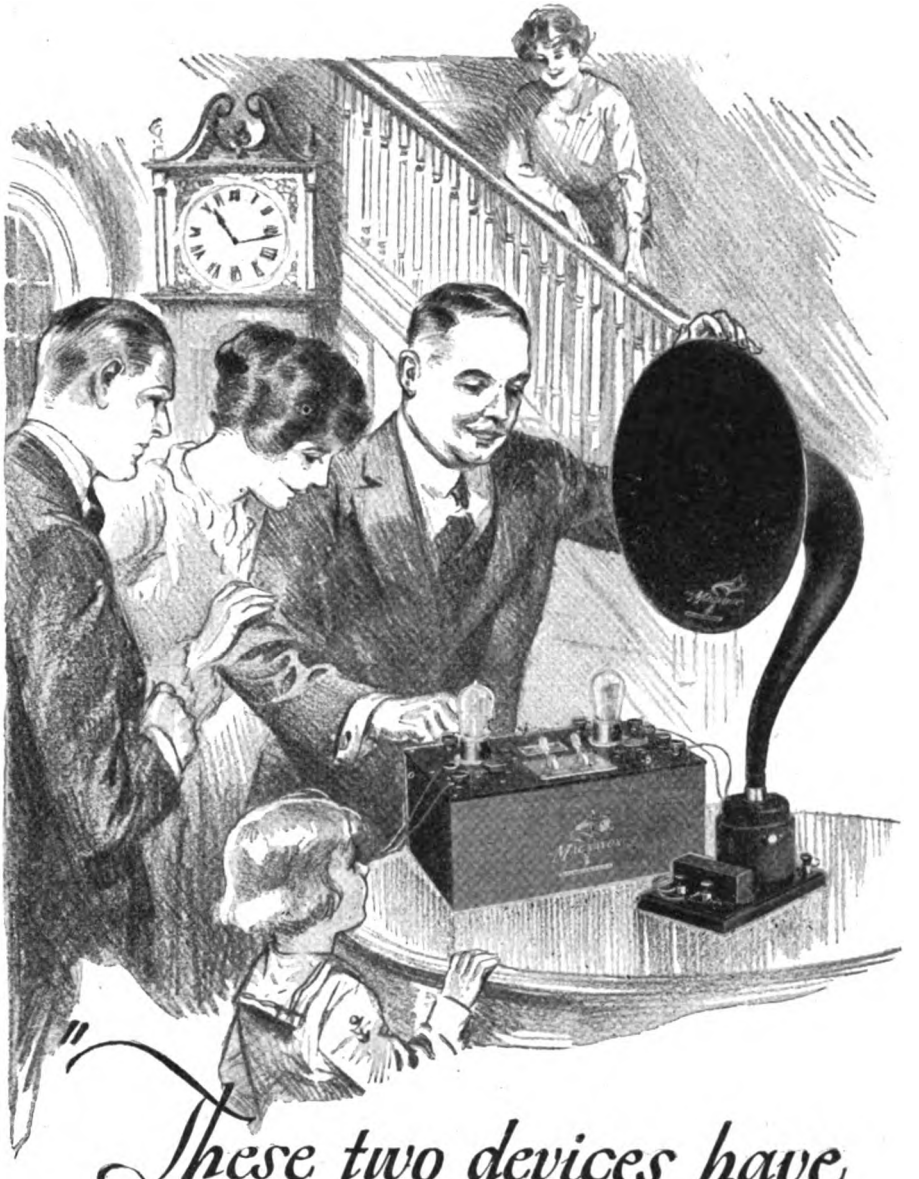
R3 Magnavox Radio
(With 14-inch horn)
As illustrated

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R2.
Price **$35.00**

Model C Magnavox Power Amplifier
As illustrated

For use with the Magnavox Radio and insures getting the largest possible power input.
AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

Magnavox Reproducers and Power Amplifiers can be used with any receiving set of good quality. Without Magnavox, no receiving set is complete.



"These two devices have revolutionized Radio"

The Magnavox Reproducer and the Magnavox Power Amplifier

THE efficiency of Magnavox Radio apparatus is best realized by comparison with other instruments constructed on less modern scientific principles.

Magnavox products can be had of good dealers everywhere. Send for copy of unusual booklet.

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MAGNAVOX Radio

The Reproducer Supreme

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Answers to Readers of Radio World

In RADIO WORLD *for March 17 you published an article with a circuit diagram by Mr. Shideler. I have constructed the set and have tried to get it to work but without success. All that I can seem to get is a persistent hum in the receivers. This is more insistent when I hold my thumb on any of the switch points and pull the switch arm away from the contact. I am using 16½ to 22½ volts on the plate and outside of using No. 20 instead of the No. 26 wire I have made it exactly as described. What is my trouble?—Edward MacDowell, 450 N. Queen Street, Lancaster, Pa.*

From your description and the fact that you get the hum even when your primary is out of the circuit, you evidently have a broken line somewhere. Go over your wiring very carefully and trace all your lines. Examine the connections on the tickler and see that everything is connected properly. This insistent hum is an indication of a break somewhere in the circuit. Find the break and you will find your trouble.

* * *

I constructed the set described in your issue of April 7, by F. J. Rumford and followed all his directions, but cannot get rid of a whistle that is very noticeable and sometimes is unbearable.

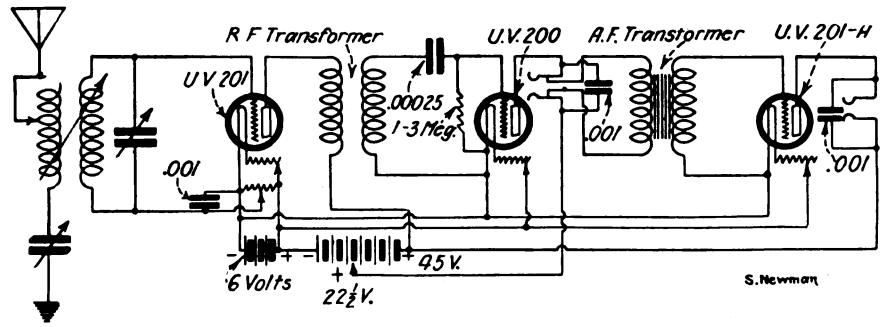
I get local stations, but there is always this steam whistle blowing in the phones. How can I remedy it?—Walter Moore, 14 S. Spring Ave., St. Louis, Mo.

Do not burn your tube so high. Cut down on the filament current. You are forcing your tube. Use a larger grid condenser (.0004 or .0005). Reverse the leads on your tickler coil. Decrease your B battery and see if that doesn't stop it. Jump the minus B across to the plus of the A instead of the minus as you have shown it in the diagram.

* * *

Kindly publish a diagram for one stage of radio-frequency, detector and one stage of audio-frequency using the following apparatus: One vario-coupler, one U. V. 201A, one 200, one 201, one 1714 radio-frequency transformer, one 712 audio-frequency transformer, two vernier rheostats, one straight rheostat, one 200 ohm potentiometer, three Dubilier .001 fixed condensers, one 17 plate variable, three sockets, two jacks, phones and batteries. What will I be able to receive on such apparatus and the circuit you are giving me?—John Bakersmith, 3202 R. I. Ave., Mount Rainier, Ind.

The diagram you desire is published herewith. It is impossible to state definitely the range of any receiving set, as there are too many conditions that are to be dealt with in the reception.



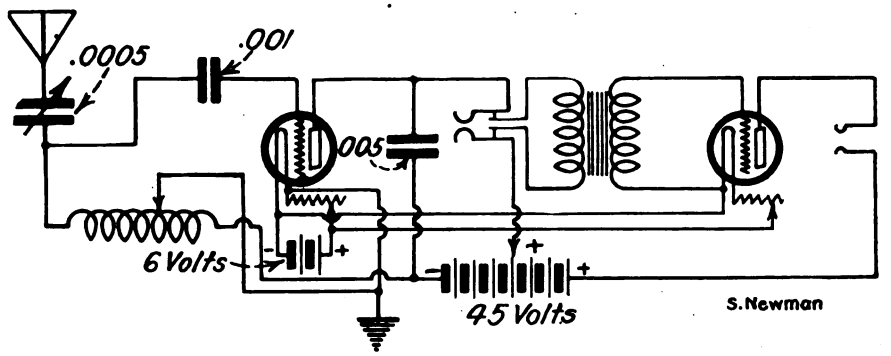
Hook-up published in answer to a request by John Bakersmith using the apparatus called for by him. The first and second rheostats are vernier and the audio-frequency amplifier rheostat is straight control. The potentiometer can be either 200 or 400 ohms.

Kindly send me, or publish, a circuit diagram for a 10 watt CW or phone set that will give me good results.—H. G. Armstrong, La Tuque, Quebec.

We refer you to the article published in RADIO WORLD for May 26 by R. W. E. Decker on a low power two tube transmitter.

* * *

Kindly give me a hook-up embodying one stage of audio-frequency with the "pup" circuit. Does the antenna condenser increase or decrease the wave length when increased from zero to full capacity?—Edw. H. Bitner, 1510 Catherine St., Harrisburg, Pa.



The "Pup" circuit with one stage of audio frequency amplification requested by E. H. Bitner. If the new U. V. 199 is used, the second tube should have a grid bias battery in the grid lead for proper operation.

The circuit you want is herewith published. As you increase the capacity you increase the wave length. When the condenser is at zero the lowest wave lengths will be responded to. When at the full capacity, the highest wave length will be responded to.

* * *

I recently purchased a John Firth five-tube set—two stages of radio-frequency, detector and two of audio. There are only two rheostats controlling the five tubes. One is marked R. F. and the other Det. There is no rheostat for the audio-frequency, but the last two tubes are controlled by an independent switch. Is this correct? Should not there be some control for the last two tubes?—I. F. KKrause, 350 Broadway, New York City.

There is no mistake in this circuit. It is designed to operate as either two stages of radio-frequency and detector, or radio-frequency, detector and two of audio. The fact that there is no control for each separate tube is just to simplify the controls. Because of the fact that audio-frequency is not critical, there need not be a filament control to these two tubes.

What are the sizes of the coils used with A. Riddel's DX hook-up published in RADIO WORLD *for March 10?—J. S. McKibben, 3522 Washington Ave., St. Louis, Mo.*

You can use 35, 50, 75 DL coils with this circuit using the 50 as primary, the 75 as secondary and the 35 as tickler. This will allow you to get the broadcast program if your antenna is not too long. It would be well to get a set of DL coils of the following sizes in order to enable you to experiment and find out just which suits your needs best for each particular wave. 25, 35, 50, 75, 100.

I recently constructed one of the sets described by W. S. Thompson in RADIO WORLD *for March 3. I am referring to diagram No. 3 on page 4. I have had excellent results with it, but desire to put in permanently a loose coupler and antenna and ground, as I cannot get sharp enough tuning with a loop. I sometimes have two and three stations on together. I can also take the catwhisker off the crystal and hear signals. Why is this? Will I be able to use the new U. V. 199 tubes with this circuit successfully?—J. D. McGee, 214 East 11th Street, New York City.*

You can incorporate the loose coupler and antenna and ground by hooking the primary up as usual and putting the secondary leads in place of the loop leads. A loop generally gives much sharper tuning than a vario-coupler or loose coupler because of its directive effects. Your set should not operate when you remove your catwhisker. You must have leakage somewhere. It often occurs in reflex sets that one of the tubes can be removed and the set will function at a very low state of efficiency, but the fact that you can get signals without your detector proves that through some channel you are using one of your tubes as a detector. Examine your leads and see that they cross at right angles, and are well insulated. Do not bunch them.

* * *

Enclosed please find picture of a set. Kindly let me know what type of circuit it is and also just what apparatus I would need to construct it.—Edward Weick, 115 Striker Ave., Woodside, L. I.

The set shown is a straight three step radio, detector and two steps of audio-frequency. The apparatus necessary to construct it would be six tubes, six sockets, three radio-frequency transformers, two audio-frequency transformers, one grid leak and condenser, five fixed condensers (two .0005, two .001 and one .00025), necessary binding posts and batteries.

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Play These DX Nite Owl Records on Your Radio

Get Out Your Glasses and Adding Machine

From Leland Whitelock, 400 Ninth St., Petersburg, Ind.

I HAVE seen many good records in your DX department and thought I would send in mine: KGW, about 2,500 miles; KMO, about 2,500 miles; KHJ, 1,775 miles; KFI, 1,775 miles; KOG, 1,775 miles; KWH, 1,775 miles; San Pedro, Catalina Islands, 1,780 miles; KZM, 1,335 miles; PWX, 1,325 miles; WKAQ, 1,325 miles; KDKA, WGY, WOS, WPA, WEAH, WBAK, WWJ, WAH, WDAJ, WBZ, WLAG, WJAG, KSD, WOZ, WDAP, WCAU, WKAA, WIAH, WDAF, 2XI, WLK, WHAM, WIAO, CFCE (about 1,300), WGM, KYW, WOAF, WBT, WJT, WJK, WHAS, WBAP, WMAQ, WJAX, WFO, WGAS, WHB, WOI, WOAI, WCAP, WLAT, WGR, WOH, WSX, WJZ, WOR, WOO, WAAY, WSB, WJAZ, WMAZ, WHAJ, 5ZA (about 1,500), WCX, WOC, WWI, WIP, WBAY, WLAP, WLW, WGAV, WMAK, WMAV, WCK, 8YM, WOK, WCAF, WDZ, WJAP, WKAM, WLAL, WHK, WKN, WPAL, KFAF, WEAB, WBL, WHAI, WBAV, WDAO, WEAF, CJCG, KLZ, 5ZY, WFAA, CFCA, NOF, 8XS, WSY, 2XB, WEAY, WNAY, WGF, 3JM, WAAP, WGAQ, WJAM, WBAH, WPAC, WNAT, WCAE, WCAV, WMAT, WAAF, WDAA, WNAL, WIAC, WCAG, WDAY, WDAG, WLB, WRP, WKAS, 9ZAF, WFAT, WQAA, WOAL, WIAR, WMH, WOAA, WEAC, WEAO, WMAB, WOE, WEAS, WCAL, 8XR, 5XAJ, WJAN, WNAD, WCAS, WPAD, WIAY, WTAW, WCM, KOP, WWZ, WIZ, WMAF, WAAC, WGAY, 4EB, WOQ, 4ET, 2XAP, WMAJ, WKY, WRW, WFAN, WIAS, WHAB, WAAR, WGI, WOAN, WOAV, WAAH, WNAC, 8XH, WPG, WJAF, WVP, WAAW, WOAW, WHAH, WRR, WDAR, WTAS, KFDL, WWAY, WHA, WDAL, CFCF, WHAZ, WAAK, WCAY, WBAA, WBAO, 8XT, WCAQ, KFFQ, WQAQ, WGV, WEAN, WGAM, WCN, WAI, WIAX, 9DMB, 9DIS, 9BYT, 9KS, CKCE, WFAV, KFDB (about 2,000 miles), WABA, KFGC, 9EJB, 9DLR, WPAB, WDAH, 9DZM.

This list of phone stations includes 211 stations in 36 States, three provinces in Canada, Cuba and Porto Rico. All these stations have been received since December.

The receiver is a home-made single-circuit set with detector only. The type C 300 detector tube was used.

Come on in, the water's fine. (This is for you other DXers.)

* * *

And Still They Come

From Gerald R. Duncan, Fayette, Iowa

IN response to your request for DX results, I am herewith sending mine. I am using Mays' capacity coupled circuit.

I have heard fifty-eight stations since hooking it up. I heard the following in one evening, in about four hours' time: WHAZ, WOC, WMC, WBAV, WSY, KDKA, WCAE, WBAM, WSD, WSAA, WOS, WGY, KDYS, WCAS, KFAF, WLW, WBL, WBAP, WGM, WLAG, WDAJ, WBA, KFEL, KFI, KHJ, KGW.

The limits of the set so far has been KGW, WOR, WSAV, WOAI, CHCQ, WDAJ, CFCA.

My aerial is two wires 65 feet long, thirty feet high, stretched between two trees. The only change I have made in the hook-up given by May is to put a 17-plate vernier in series with the aerial.

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

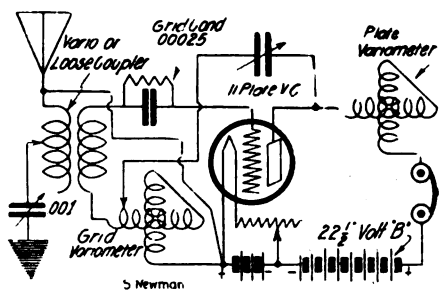
Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

Here's One to Try Out

From Myrle Wood, Star Route, Rhinelander, Wis.

I AM sending you a hook-up that I am using, and I am getting some remarkable results with it. With this hook-up I have heard nearly 100 stations. The most distant ones are: PWX, Havana, Cuba; WKAQ, San Juan, Porto Rico; KHJ, KFI, KDZF, Los Angeles, Cal.; KFC, Seattle, Wash.; KGW, Portland, Ore.; WPAT, El Paso, Teas; WOAI, San Antonio, Texas; WFAA, WGR, Dallas, Texas; WBAP, Fort Worth, Texas; KFAF, Denver, Colo.; WSB and WGM, Atlanta, Ga.; WDAJ, College Park, Ga.; WEAF, New York City; WGY, New York.



Myrle Wood's one tube hook-up. Note the connection on the grid variometer. Tap off on the outside connection of the stator and bring it around to the plate variometer—and, "Oh, what a grand and glorious feelin'!"

WOC, WCX and WGY can be heard all over the room some nights on the one tube. The tube is a WD-11. The wire running from the aerial to the positive of the dry cell (A battery) does away with a lot of capacity effect. When connecting up the 11-plate variable condenser between the two variometers be sure that one wire from the condenser connects with the plate wire that runs to one side of the variometer and the other wire from the condenser should be connected to the side of the variometer that the secondary wire is connected to. Very fine tuning can be accomplished with this circuit, and it is very good for DX work. I have heard WLAG, Minneapolis, with no aerial and no ground and I hear WSB, Atlanta, Ga.; WJZ, Newark, N. J., and others on a loop aerial. And I have heard as far as Fort Worth, Texas, during the day. I am a steady reader of your magazine and think it is fine.

* * *

You'll Have to Step Some to Catch This Boy—I'll Tell It!

From Don Smith, Graford, Texas

I AM a six months' crystal fan. My set consists of one two-slider tuner, crystal detector, and one pair 3,000-ohm phones. My aerial is a single wire 100 ft. long and 30 ft. high. I have a total of 23 stations, the farthest being KHJ at Los Angeles, a distance of 1,250 miles, which I believe is not bad for a crystal. My single night record is 11 stations: WMC, Memphis, Tenn; WOS, Jefferson City, Mo.; WOAI, San Antonio, Tex.; WEAY, Houston, Tex.; WMAB, Oklahoma City; WHAN, Wichita, Kan.; KSD, St. Louis, Mo.; WHA, Madison, Wis.; WFAA, Dallas, Tex.; WDAO, Dallas, Tex.; WPA, Fort Worth, Tex.

* * *

Another Nice Record

From C. C. Barber, Villa Alta, Colonial Heights, Yonkers, N. Y.

BEING particularly interested in your DX page I thought I would send in my record and would be greatly pleased if you would publish it. The hook-up that I am using is a modified Colpitts with variometer tuner and a WD-11 tube. I have picked up Chicago and Atlanta on an aerial around the molding of my room.

The following is a list of the stations: WJZ, WOR, WAAM, WBS, WBAN, WEAF, WHN, WRW, WGY, WHAZ, WBZ, WGI, WIP, WDAR WOO, WCAE, KDKA, WBT, WMC, WNAV, KSD, WOS, WOC, WDAF, WAAZ, WPAD, WJAZ, KYW, WLAG, WWJ, CKCE, CHYC, CKAC, WLK, WLAK, WGR, WFI, WIZ, WBAA, WSB, WBAY, WFAF, and four amateur stations.

Another Golfer in the Rough

From C. L. Hobart Company, Grants Pass, Oregon

HAVING read in the radio journals of "Radio Golf" and on March 20th, as atmospheric conditions were favorable, decided to try it with the following results:

Station	Location	Miles away
BE1	Camp Lewis, Wash.	375
KSD	St. Louis, Mo.	1,825
KDYL	Salt Lake City	600
KQY	Portland, Ore.	250
KFI	Los Angeles	700
WHB	Kansas City	1,600
KHJ	Los Angeles	700
	Catalina Telephone	700
KZR	Bellingham, Wash.	450
KFAU	Boise Idaho	365
KFCF	Walla Walla, Wash.	365
KNT	Aberdeen, Wash.	325
WBAP	Fort Worth, Texas	1,600
WCX	Detroit, Mich.	2,125
WOAI	San Antonio, Texas	1,725
CHBC	Calgary, Canada	800
KFFO	Hillsboro, Oreg.	240
KWG	Stockton, Calif.	350
KMJ	Fresno, Calif.	500

19 stations. 15,595 total mileage.

Two hours and ten minutes, nineteen stations, with a total of 15,595 miles, from three points of the compass. Used a modified Flewelling "flivver" circuit with one peanut tube.

These One-Tube Babies Get 'Em!

From W. F. Gray, 5145 Terry Ave., St. Louis, Mo.

HAVING read the DX records in your magazine for some time I thought I would give you my list of stations.

These stations have been heard from January 1, 1923, to March 17. They are as follows: PWX, KHJ, KFI, WOAI, WFAA, WBAP, WCAR, WQAA, WIP, KDKA, WWZ, WGY, WCX, WWJ, WBAD, WLAG, WHA, WFAC, WBT, WGM, WSB, WDAJ, WDAP, WMAQ KYW, WBL, WAAP, WOC, WHB, WDAF, WHAH, WOS, WOAL, KZL, KFDL, WOR, WLW, WNAV, WMC, WHAS. Local—KSD, WCK, WRAO, WMAY.

The hook-up is a one-tube set, homemade.

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"When you come right down to it a profitable business is principally dependent upon two things—a salable article of quality, and advertising."—William Wrigley, Jr.

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. *Telephone Bryant 4796*

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of Radio World, by the following:

Frank Ameel, Jr., 88 Grand Ave., Mt. Clemens, Mich.
Ray McCarthy, 111 Cass Ave., Mt. Clemens, Mich.
Bud Prevost, 368 Cass Ave., Mt. Clemens, Mich.
Howard Smith, 982 State St., Appleton, Wis.
Radio Shop, 1070 Elizabeth Ave., Elizabeth, N. J. (Retailers and distributors.)
A. R. Reimsnider, Dorsey, Md.
Jas. H. L. Jewell, 76 Livingston Ave., Albany, N. Y. (Retailer)
K. D. Miller, Johnstown, N. Y.
H. L. Conrath, 355 North Craig St., Pittsburgh, Pa. (Wants a three tube receiver.)
Frank J. Franzreb, 132 Van Duzer St., Tompkinsville, S. I., N. Y.
John Vaughey, Sr., St. Marks Place, Tompkinsville, S. I., N. Y.
Chas. Enderes, 660 Bay St., Stapleton, S. I., N. Y.
Stephen Storey, 2221 Fairfield Ave., Fort Wayne, Ind.
W. B. Powell, Eustis, Fla.
Arthur O. Halley, 53 Thorndike St., Arlington Mass.
Herbert W. Jones, 85 Draper St., Dorchester, Mass.
Chas. Fisher, Box 492, Mitchell, Neb.
M. J. Geer, Box 62, Sabetha, Kan.
Harold Kutzley, 11 Twelfth St., Toledo, O.
Salamanca Electric Co., Inc., 12 Main St., Salamanca, N. Y. (Retailer.)
Chas. W. Gray, Brisben, N. Y. (Retailer.)
Chas. G. Rose, Post Office, Lorain, O.
John Orsznlak, 183 Goodyear Ave., Buffalo, N. Y.
Elmer Zimdors, 1060 Richards St., Milwaukee, Wis.
A. B. Watson, 2760 Cherry St., Kansas City, Mo.
Carolina Radio Co., 306 N. Tryon St., Charlotte, N. C. (Manufacturers, distributors and jobbers.)
Fred D. Alexander, P. O. Box 593, Pikesville, Ky. (Will open at once a radio and small specialties shop in Dayton, O.)
H. G. Bradford, 95 Hansel St., Atlanta, Ga.
William D. Snow, 303 Sherburne Ave., St. Paul, Minn.
George Slocomb, Engineering Dept., Southern California Edison Co., Los Angeles, Calif.
John F. McKiernan, 76 West St., New Haven, Conn.
Percy W. Shepard, New Albany, Pa.
Howard W. Root, Derby Line, Vt. (Will stock a line of radio supplies.)
A. G. Walden, Tech. Sgt., Q. M. C., Fort McPherson, Ga.
Dr. Frank Lamb Willson, 815 Hill St, Suite 704, Los Angeles, Calif
E. Eddy, 213 Grant Ave., Millvale, Pa.
Edward L. Fitzgerald, Hebron, Neb. (Intends to sell sets and parts.)
William O. Wulffe, Walcott Lathe Co., Jackson, Mich. (Is building sets for sale.)
Luman Long, 1003 Park Street, Rolla, Mo.
Thomas A. Moore, 557 Walnut Street, Elizabeth, N. J.
Jackson & Son, Como, Miss. (In market to buy set.)
T. J. Thompson, 301 West 110th Street, New York City. (Dealer.)

Brandes Add to Factory Space

C. BRANDES, INC., manufacturers of Brandes matched tone headsets, 237 Lafayette Street, New York City, have recently added another 5,000 square feet of floor space and a great deal of machine equipment to their assembly plant in order to handle the increase in business. Mr. Frederick Dietrich, president, states that the future seems to hold forth every prospect of a decidedly successful year.

Son of Theatrical Attorney Wins Radio Prize

ABNER H. BEREZNIAK, son of Leon A. Berezniak, prominent Chicago theatrical attorney, won first prize in a Chicago radio contest last week.

Station WPAD conducted by the Wieboldt Store, Chicago, announced that they would give five prizes to the five best entries submitted in what they called a "Radio Suggestion Contest." The people listening in were to send in suggestions for a contest which WPAD could use in the near future. The entries were to also include a means for distributing twenty prizes.

Young Abner, who is 17 and an ardent radio "fan," submitted his entry for a "Musical Memory Contest." His suggestion briefly was for WPAD to broadcast for two weeks previous to the night of the contest various classical and popular pieces. The night of the contest they were to broadcast twenty of the pieces which had been played before, picking these pieces at random, and the "listeners in" were to send in the names of the pieces they believed had been broadcast.

The unique part of his idea was that the answers were to be sent in in story or poetry form. The people submitting entries were to write up the names in some form which could be broadcast and make interesting "listening."

The prize he won was an Olympian phonograph donated by a Chicago musical store. The "Musical Memory Contest" is being broadcast this week over WPAD.

Of Interest to Dealers

THE New York Coil Company announces for distribution a new receiving set at a medium price, a new inductance switch and a new vernier condenser, all of which will go into quantity production at once to supply a demand created by the company's other well known radio products. New descriptive literature has been prepared and will be mailed upon request to the New York Coil Company, 338 Pearl street, New York City.

Radio Manufacturer Publishes His Own Music

AS a result of the controversy between the broadcasting stations and an association controlling the copyrights of certain musical compositions the Crosley Publishing Company, of Cincinnati, has just issued, in printed form, a copy of "Somebody Else Is Stealing My Sweetie's Kisses," which was made popular by presentation to radio audiences through broadcasting station WLW, of the Crosley Manufacturing Company, Cincinnati.

Wants Crystal Detectors

JAMES A. HAMILL, Mercer and Colgate Streets, Jersey City, N. J., informs RADIO WORLD that he is in the market for a considerable number of good crystal detectors of the fixed or semi-fixed type.

Policy Committee of the Radio Trade Association

President Henry M. Shaw, of the Radio Trade Association, 1133 Broadway, New York City, has appointed the following Committee on Policy of the association:

Raymond Francis Yates, Electrical Corporation of America.
Harry M. Konwiser, *The Radio Dealer.*
H. Gernsback, *Radio News.*
Roland Burke Hennessy, RADIO WORLD.

Questions regarding the policy of the association as brought up by individual members will be discussed by this committee and transmitted to the board of Directors for final decision.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

NATIONAL ELECTRIC LIGHT ASSOCIATION, New York City, June 4-8, 1923; M. H. Aylesworth, executive manager, 29 West Thirty-ninth Street, New York.

PACIFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Calif., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Calif.

Moves to Larger Quarters

THE Federal Radio Equipment Corporation, that has been located at 11 Broadway, New York City, has moved to new and larger quarters at 6 Murray Street where they have taken over an entire floor for the distribution of Pathfinder Products. Meanwhile at the laboratory, research work continues under the direction of Mr. Verner Hendrickson, (1BKA—also 1XAK) who is an old time wireless amateur. It is the Pathfinder intention, at least whenever possible, to give aid and assistance to the amateur and novice whenever he has need of such for the future development of radio. When these plans are completed announcement will be made.

A New Bradleystat

THE Allen-Bradley Co., 286 Greenfield Avenue, Milwaukee, Wisconsin, have recently placed upon the market a new model of the well known Bradleystat which can be used with all detector and amplifier tubes. The new model, known as the Universal Bradleystat with three terminals, provides extremely wide control in three ranges obtainable by using the proper pair of terminal connections. By means of the new Universal Bradleystat, radio enthusiasts and radio manufacturers can use one rheostat for all tubes and enjoy the same wide range of stepless, noiseless control which the older Bradleystat models provided for a limited number of tubes. The use of scientifically treated discs enables the Allen-Bradley Co. to guarantee the Universal Bradleystat to give perfect filament control for all tubes.

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New List of Boys' and Girls' Summer Camps

FOLLOWING is a list of names and addresses of directors of boys' and girls' summer camps, each of whom should be a potential purchaser of radio sets for camp and vacation use. This installment completes the list.

John P. Sprague, 825 Lincoln St., Evanston, Ill.
F. E. Bachhuber, Minocqua, Wis.
Wm. F. Thorpe, Thorpe Acad., Lake Forest, Ill.
G. A. Roger, 700 West Euclid Ave., Detroit, Mich.
Lotta Broadbridge, The Palms Apt., Detroit, Mich.
Homer L. Thomas, 1304 29th St., N. Birmingham, Ala.
H. R. Crook, 5964 N. Hermitage Ave., Chicago, Ill.
A. O. Kelley, Soldan High School, St. Louis, Mo.
A. G. Whitney, Syracuse Univ., Syracuse, N. Y.
Roy S. Claycomb, 14 Clifford St., E. Orange, N. J.
E. A. Chapaan, St. Andrew's College, Toronto, Canada.
A. S. Gregg Clarke, Washington, Conn.
Edward Soles, 308 W. 93d St., New York.
W. L. Wise, Bordentown, N. J.
C. V. P. Young, Cornell Univ., Ithaca, N. Y.
W. L. Childs, New Trier H. S., Kenilworth, Ill.
J. Beach Cragun, Univ. of Chicago, Chicago, Ill.
A. L. Cochrane, Upper Canada College, Toronto, Canada.
Miss Chris Marie Noble, P. O. Box 481, Santa Barbara, Cal.
Miss Sally Joy Leadbetter, P. O. Box 481, Santa Barbara, Calif.
Miss Cecilia C. Kays, 741 New Hampshire Ave., Los Angeles, Calif.
Miss Mollie E. Utz, 158 N. Main St., Salt Lake City, Utah.
Wm. B. McKingert, Berkeley, Calif.
Miss Portia M. Swett, (Winter) Carmel-by-Sea, Colo.
Mrs. Wm. E. Sargent, New Bedford, Mass.
Wm. H. Brown, 311 W. 83d St., New York.
Harry R. Dane, 548 Parkview Ave., Detroit, Mich.
John Linker, 175 E. 79th St., New York.
Elmer Huppert, M. D., 116 W. 59th St., New York.
Martin B. Cohn, 220 W. 98th St., New York.
Maj. Wm. K. Gunn, University School, Cleveland, Ohio.
E. C. Cook, Annandale-on-Hudson, N. Y.
Mr. and Mrs. C. P. Hulbert, 77 Addington Rd., Brookline, Mass.
Lyman B. Tobin, 29 W. 55th St., New York.
W. W. Elder, 39 Draper Terrace, Montclair, N. J.
Leo Bernheim, 880 Southern Boulevard, New York.
D. Ralph Starry, 1309 Denmark Rd., Plainfield, N. J.
S. W. Berry, 311 W. 93d St., New York.
William Zelenko, 850 E. 161st St., New York.
Walter Hullihan, Newark, Del.
Frank F. Hooper, Chattanooga, Tenn.
L. E. Crouch, Noel Block, Nashville, Tenn.
T. G. Russell, Staunton Military Acad., Staunton, Va.
Henry E. Polley, 34 Park St., Oshkosh, Wis.
W. J. Monilaw, M. D., University of Chicago, Chicago, Ill.
F. G. Mueller, Camp Indianola, Madison, Wis.
F. H. Everhardt, M. D., 5204 Kensington Ave., St. Louis, Mo.
W. O. Greene, Kirkwood, Mo.
Frank Hamsher, Webster Groves, Mo.
Louis J. T. Lahrs, 327 W. Ferry St., Buffalo, N. Y.
John J. Mackay, 934 Yale Station, New Haven, Conn.
Erwin S. Spink, Woodland School, Phoenicia, N. Y.
George Jackson, Asheville School, Asheville, N. C.
Reese Combs, Miami, Fla.
Irving M. Fish, Haworth, N. J.
George B. Young, Bushkill, Pa.
Daniel C. Beard, Flushing, Long Island, N. Y.
B. M. Slater, Box 82, Long Valley, N. J.
Wm. Mitchell, 920 Cauldwell Ave., New York.
Mr. and Mrs. E. W. Sipple, 350 W. Duval St., Philadelphia, Pa
Ernest L. Noone, 350 W. Duval St., Philadelphia, Pa.
Maxwell A. Croche, 2121 Foster Ave., Brooklyn, N. Y.
Robert E. Beaton, 349 Walnut St., Sewickley, Pa.
Col. L. L. Rice, Lebanon, Tenn.
Wm. R. Webb, Jr., Bell Buckle, Tenn.
J. V. Brown, Pres., San Marcos (Tex.) Academy.
Byron N. Clark, Y. M. C. A. Bldg., Burlington, Vt.
A. C. Hurd, White River Junction, Vt.
H. J. Wyckoff, Haverford School, Haverford, Pa.
Mrs. Wm. E. Sargent, New Bedford, Mass.
Chas. H. Farnsworth, Teachers' College, N. Y.
Mrs. C. H. Farnsworth, 509 W. 121st St., New York.
Miss Louise Green, Cass Technical School, Detroit, Mich.
Mr. and Mrs. F. M. Chubb, 130 Maplewood Ave., N. J.
Miss Mabel L. Evans, 618 Union Boulevard, St. Louis Mo.
Mr. and Mrs. H. D. Sleeper, 76 Crescent St., Northampton, Mass.
Frank L. Bryant, 466 E. 17th St., Brooklyn, N. Y.
W. W. Clendinin, 120 Vista Pl., Mount Vernon, N. Y.
Miss Anna Dodge, North Thetford, Vt.
Miss Gertrude E. Clarkson, 84 Lorimer Ave., Providence, R. I.
Mr. and Mrs. C. A. Roys, 10 Bowdoin St., Cambridge, Mass.
Prof. and Mrs. A. E Winslow, Northfield, Vt.
Mr. and Mrs. E. W. Clark, Northfield, Vt.
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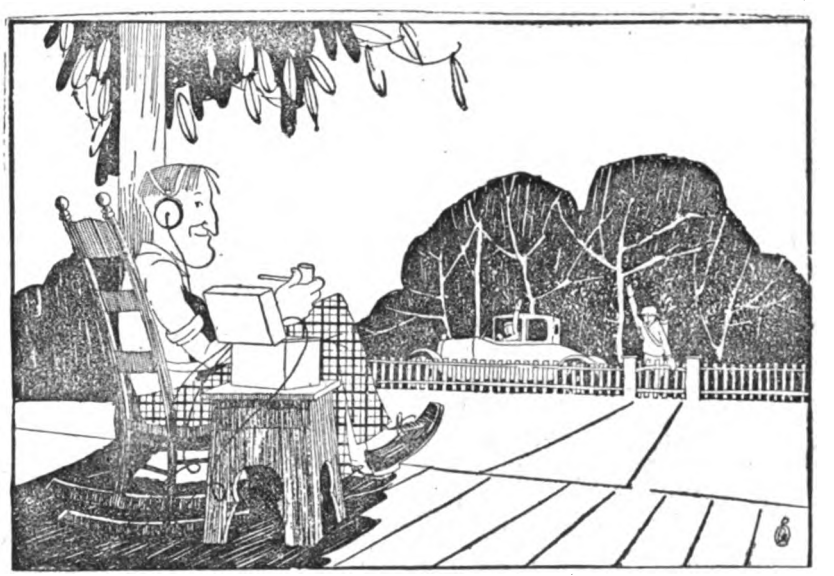
Broadcast Bill's Radiolays

By William E. Douglass

SOME people like to do one thing an' some folks like another, but fer be it from me to judge my neighbor or his brother. A funny place to live in this old world of ours would be if everybody like to do the same as you er me. There's Hezekiah Singletree who plays the clarinet. I'll bet he's practiced twenty years an' can't play nothin' yet. He tunes up every mornin' an' I hear him every night. I' spect in fifty years or so he'll learn to play it right. Ol' Hezekiah's youngest son what went away to school, has got a new game started here he calls "Cow pasture pool." He sez I ought to try fer he knows I'd like it fine; I told him nothin' doin', none of that fool game fer mine. My next door neighbor Silas Brown has bought a brand new bus, it's what he calls a coopie and it don't have room fer us. On Sundays him an' Lil start out,—sometimes they're gone all day, but I don't think I'd like it much to spend my time that way. While he's out burnin' gasoline I'm sitting there at home a takin' life real easy with a headset on my dome. I hear the chapel service from a big broadcastin' station er mebbe sacred concerts from half way across our nation. I can't afford a high priced care to tour the country wide, ner do I care to bat a ball around the mountain side; and as fer homemade music —well I'd rather have the brand that's broadcast some evenin's by that military band. So while these stations send out news an' music superfine, I'm pilin' up my jitneys in that savin's bank of mine, fer I don't have no bills to pay fer oil er gasoline, an tires aren't expenses fer a radio machine. Some people like to do one thing an' some folks like another, so fer be it from me to judge my neighbor er his brother. I'll just keep right on "listnin' in" an' pilin' up my rocks, an' there'll always be tobacco in my old tobacco box.



"I'll just keep right on 'listnin' in.'"

(Copyright, 1923, Westinghouse Electric & Manufacturing Company.)

A Pleased Reader Sends Thanks from the Depths

Editor Radio World:—The article in May 12th Radio World by C. H. Stoup is the best of its kind I've seen since radio "came in." The circuit, of course, is good but his instructions as to tuning deserve to be reprinted and sent to every owner of such a set.

I began two years ago with a regenerative set. We are from 50 to 200 feet below sea level here and the summer heat is 110 to 125 degrees. We have static that is static and dust storms that paralyze our tubes. We have tried everything we ever heard of once. We get good results up to 1,500 miles and in cool weather as far as PWX and WGY. The only way to get results is to follow, word for word, Mr. Stoup's instructions. He certainly knows what he is writing about. This article two years ago would have saved me a lot of grief. Thanking you and Mr. Stoup.

Yours truly,
DR. W. M. CLARK.
Coachella, California.

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What Western Fans Like in Broadcasting

By Alice L. Webb

A QUESTIONNAIRE was sent out to all radio fans who had written in to the operator reporting hearing station KFAE, State College of Washington, at Pullman, Wash. Answers were received from 89 of these, of whom 14 were farmers, nine high school set operators. Reports that the signals were unsatisfactory came from two, while 69 said they came in clear and strong, and three that they were too strong. Music was preferred or more of it desired by 17, while 28 wanted more lectures, and 20 reported the present program arrangements satisfactory.

Of those desiring more lectures, a number requested special subjects, particularly radio, both theory and practice. One farmer asked for market and crop reports, another for lectures on history, ancient and modern, and another on language, Spanish or French.

Trouble with tubes and batteries has caused some interruption with recent programs, but that is now rectified ,and distance tests will be made to see how far the broadcast is heard. A Saskatchewan fan won the book offered to the first one 500 miles or more away who reported hearing the book news broadcast.

First Chilean Electric Locomotive

AT the preliminary trial of the first electric locomotive to be run on the Chile State Railways an old woman crossed herself, threw stones at the Baldwin-Westinghouse electric locomotive, and cursed it as the work of the devil. The children who were present threw flowers in the path of the passenger locomotive as it slowly moved down the track. These two demonstrations illustrate how easily the younger generation takes to new ideas. President Alessandri, of Chile, at the official trial several days later, acted as engineer and his American ambassador as assistant as the electric locomotive pulled the first train from Santiago to Tiltil and return. The main artery of the Chilean State Railways is now being electrified. The order for the necessary apparatus, including 33 locomotives and equipment for three substations, totaling $7,000,000, which was awarded in 1921 to the Westinghouse Electric & Manufacturing Co., was the largest foreign order ever received for railway electrification apparatus by any one firm in Europe or America.

New RCA Official in Washington

MR. F. P. GUTHRIE, until recently head of the Radio Division of the Shipping Board, has been appointed district manager for the Radio Corporation of America, with headquarters in Washington, D. C. Mr. Guthrie has followed radio for years and during the war served as a commissioned officer in the Naval Communication Service. It is understood that he will have charge of the corporation's new broadcasting station soon to be opened in Washington, D. C., as well as the commercial work.

Mr. A. H. Morton, who has been in charge of the corporation's commercial station at Washington for some time, has been transferred to New York where he will take up organization duties in that district.

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Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

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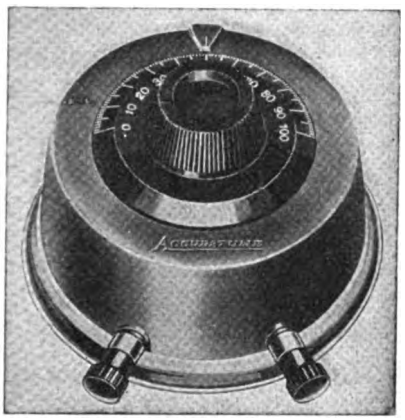

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Tubes Replacing Spark Transmitters in Navy

THE Navy communication service both afloat and ashore is rapidly abandoning its spark transmitting sets for new vacuum tube sets, in accordance with recommendations of the Radio Division of the Bureau of Engineering.

Recent experiments indicated that tube sets give excellent results and are far superior to the old sparks. A comparative test between the 100 KW spark set at Arlington, NAA, and a new six KW tube installed there, demonstrated that the new tube will be satisfactory. Naval stations at San Juan, New Orleans, Balboa, San Diego and ships in the Atlantic and Pacific advised that the tube signals were read more easily and had slightly more audibility. The tube set showed harmonics, one of which was on about 350 meters, but with modifications it is hoped that these can be eliminated.

A further successful test between the six KW tube set and the 30 KW arc at NAA was made recently, in which the tube set showed up well. It is probable that arc sets will eventually be discarded, but at present only new stations will get tubes except in replacements.

Two New Radio Manuals

THE E. I. Company, New York City, has just issued two radio manuals under the titles "How to Tune Your Radio Set" and "100 Radio Hook-Ups." Each retails for 25 cents. The author is Maurice L. Muhleman, of the staff of *Radio News*.

In the manual on tuning the author begins by giving the reader a concise outline of just what should be done to tune different types of vacuum tube receiving sets so that he may get the most out of his own outfit. The first step is a thorough understanding of radio waves, and these the author proceeds to explain in a clear and simple manner, assisted by several diagrams.

The manual on hook-ups contains 100 clearly drawn diagrams of circuits, as well as a number of explanatory diagrams, and a schedule of symbols used in the hook-up drawings. Instruments used in the reception of radio telegraph and telephone messages are described briefly.

Amateur Station Heard 11,000 Miles Away

ANNOUNCEMENT was made at Hartford, Conn., recently that an amateur wireless station had succeeded in transmitting signals approximately half way around the world, establishing a new long distance record. A ship operator reports he heard the station operated by E. W. Rouse at Galveston when he was 100 miles southeast of Ceylon in the Indian Ocean, a distance of 11,000 miles.

Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

N addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

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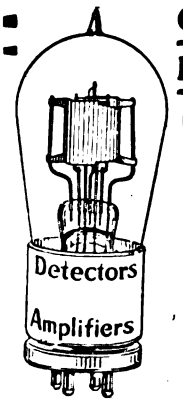

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Will-Fred Electrical Manufacturing Corp.; $20,000; W. O. and B. A. Feldman, E. F. Caines. (Attorneys, Mann & Buxbaum, 886 Broadway, Brooklyn, N. Y.).

Chapman Marine and Industrial Supply Co.; make electric merchandise, $10,000; W. C. Chapman, H. J. and E. O. Baitinger. (Attorney, E. Schwartz, 165 Broadway, New York City.)

Radio Engineering Co., New York, has increased its capital stock from $50,000 to $3,500,000.

Independent Radio Manufacturers, Del., 50 shares common stock, no par value; reprs., S. B. Howard and G. V. Reilly, 65 Cedar Street, New York City.

Reliable Electric Motor Co., New York City, has increased its capital stock from $5,000 to $25,000.

Spitler Electric Co., New York City, $15,000; R. W. Spitler, H. H. Roberts, J. Bachran. (Attorney, N. O. Suskind, 15 William Street).

Power Construction & Engineering Corp., Albany, N. Y., $10,000; A. S. Lyon, J. C. Looby, B. J. Savage. (Attorneys, Tracey, Cooper & Savage, Albany).

Port Chester Battery and Ignition Corp., Port Chester, N. Y., $15,000; F. A. and C. H. Post, C. G. Pryor. (Attorney, S. F. Swinburne, New Rochelle).

Electrical Testing Laboratories, New York City, has increased its capital stock from $240,000 to $480,000.

Stahot Electric Corp., New York City, electrical appliances, $1,500,000; A. B. Meserlyn, E. A. Jones, R. B. Larkin, New York. (Registrar and Transfer Co.).

Hallowell Radio and Electric Corp., Dover, Del., $500,000. (Corporation Guarantee and Trust Co.)

United Battery Corp., Wilmington, manufacture storage batteries, $3,000,000. (Corporation Trust Co. of America.)

New York's Silver Jubilee Announcement Broadcast

Grover A. Whalen, Commissioner of Plant and Structures for the City of New York, recently broadcast through Station WJZ an extended announcement of the Silver Jubilee which the city will celebrate from May 26 to June 23. In response to a request for those who had heard the speech to acknowledge the fact, letters were received, among many others, from the following:

T. Ahearn, 584 Laurier Ave., West, Ottawa, Canada.

W. Gibson, 40 Barker Ave., White Plains, N. Y.

Abigail A. Banton, 67 Palm St., Bangor, Me.

Clendenin Eckert, Ellidore, Stamford, Conn.

L. M. McCormack, Martinsburg, W. Va.

W. R. Dickinson, Erlanger, Ky.

Standardization of Discounts in the Radio Industry

THE Radio Trade Association of New York City has appointed a Committee on Standardization of Discounts in the radio industry. Members have been requested to communicate to the committee their views on proper discounts to retailers, jobbers, manufacturers' agents, department stores and manufacturers on complete sets, parts and machine screw parts. This information will form the basis of the committee's final report.

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Refilled Tubes Always in Stock
Our repaired tubes speak for themselves
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Radio Books to Read on Your Vacation

THERE will be hours of lounging and taking it easy on your vacation that profitably and agreeably may be employed in radio reading. Following is a short list of books which will afford interest and information to the radio enthusiast who is genuinely fond of the art:

"Letters of a Radio-Engineer to His Son," by John Mills, of the Western Electric Company's engineering department. New York, Harcourt, Brace & Co. This is a popular account for real boys of the fundamental principles of radio communication, written by one who knows his subject thoroughly and has the happy knack of imparting his knowledge to others. 265 pp., fully illustrated.

"Radio Reception," by Harry J. Marx, technical editor, The Radio Digest, and Adrian Van Muffling, consulting engineer. New York, G. P. Putnam's Sons. 241 pp., 129 illustrations and diagrams, including many hook-ups. Special reference is made by the authors to practical tuning and to radio and audio-frequency amplification. Every effort has been made to cover only the essentials necessary to convey to the reader a clear conception of the fundamental principles of radio reception.

"Elements of Radio Telephony," by William C. Ballard, Jr., Assistant Professor of Electrical Engineering, Cornell University. New York, The Columbia Print, 1493 Broadway. Over 140 pp., many illustrations. The reader with a technical background will find this book exactly fulfills its purpose, which is to give in an authoritative manner a clear and accurate exposition of radio telephony and its underlying principles.

"Radio," by John R. Irwin. New York, Edward J. Clode. 280 pp., many diagrams and profuse definitions. Lieutenant Irwin begins his book with a preliminary discussion of radio and its history and follows with a complete, concise, practical radio course. The latter part of the book is made up of a series of questions and answers which cover almost every conceiveable radio problem.

"The Book of Radio," by Charles William Taussig, Associate Member, Institute of Radio Engineers. New York, D. Appleton & Co. 447 pp., 181 illustrations. This book reviews the field of present-day radio development in a popular and practical fashion. It is full of information on the construction and manipulation of radio apparatus and discusses the public and private uses to which radio is being put. In a certain degree, the many aspects of radio are here treated as in no other book of its kind.

DeForest Stock Subject of Suit

A SUIT claiming that 86 per cent of the stock of the De Forest Radio Telephone and Telegraph Company had been sold to Edward H. Jewett of Detroit and his associates for $670,000 has been filed in the Supreme Court of New York by Abram C. Wisner of Toronto and Wiley R. Reynolds of Jackson, Mich., against Lee De Forest, Charles Gilbert and Randall M. Keator of New York City. The complaint asks $44,500 on the ground that the defendants controlled the stock and that they had agreed to sell to the plaintiffs for $656,500. Wisner and Reynolds claim that they paid $31,000 on account of the stock, and spent $13,500 interesting other purchasers, and finally induced Mr. Jewett and his friends to buy it. It was said that he had paid $158,000 on account. The plaintiffs seek to recover the money they paid on the stock and their expenses.

Not an adaptation of old methods of current control, but distinctly designed to utilize the great tuning possibilities of the vacuum tube itself.

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Especially U. V. 199's and all dry cell tubes, permits accurate and superfine adjustment necessary at critical operating point. Regulated at the factory to the ideal "off" point for all tubes obviating the necessity of tampering with any screws or adjustments.

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Made in three sizes.
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Westinghouse Has A Satisfactory Year

THE net income of the Westinghouse Electric & Manufacturing Company for the year ending March 31, 1923, was $12,263,485 as shown by the company's annual report. The dividend requirements were $6,033,428, so that over twice this amount was earned and more than six million dollars added to the surplus. Gross sales for the year were $125,000,000, which represents an increase of $25,000,000 over the sales of last year. The cash position of the company is a strong one, the current assets totalling over $106,000,000 and the current liabilities less than $17,000,000.

"The bookings of new business steadily increased during the year," states Guy E. Tripp, Chairman of the Board of Directors, "and the value of unfilled orders at the close of the year was $61,914,237, as compared with $50,740,696 at the close of the previous year. The relations between the company and its employees are satisfactory. Under the company's Insurance and Savings Plan, two-thirds of the employees owned insurance of $500 or more each. The deposits by the employees in the Savings Fund are accumulating at a rate in excess of $100,000 a month, and the total savings to date are in excess of $2,000,000. The savings are invested for the benefit of the employees and are not used in any way in the company's operations."

A plant located at Sharon, near Pittsburgh, Pa., was acquired during the year, and it is planned to concentrate the manufacture of transformers there. Two hundred dwelling houses, located near the company's South Philadelphia Works and formerly the propertv of the Emergency Fleet Corporation, were purchased and are being sold to employees.

Some Hints for Radio Happiness

DON'T expect your loud speaker to give much satisfaction on one tube. It can't be done.

Burn your bulbs up high and cut off about two-thirds of their useful life. They always give better satisfaction if burnt lower.

When you get your set, immediately get a screwdriver, pliers and hammer. Open it up to see what makes the wheels go round and if you can't make it work better than it originally did, take it back and try and collect your money.

Leave your tubes burning all night. It makes a nice, bright light, and doesn't run up the electric bills. Dad will appreciate it.

When you hear about a new tube circuit or piece of apparatus, always knock it, whether you understand it or not. People will then know that you are a newcomer and don't understand radio, and you won't have to disguise yourself.

Radio Definitions—But Different!

Loud speaker—A politician standing on a soap box.

Amplifier—A female scandalmonger.

Detector—A wife's inspecting kiss when you arrive home late.

Oscillator—A woman in a hat shop with Paris creations—and hubby's bank-roll.

Receiver—Friend wife every pay day.

Antenna—Those funny things on a butterfly's head.

Ground—What is left in the coffee pot.

Transformer—Paint, powder and a per-

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Green Wire—All Parts Highly Nickel Plated—The Pall Mall is the Coupler That Makes a Good Set Better.
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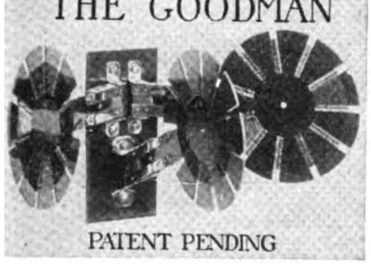

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The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

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$8 PHONES $2.25
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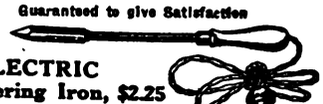

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Radio Can't Save Sinners, Says Cardinal Dubois

SERMONS broadcast by radio can never convert sinners, Cardinal Dubois, Archbishop of Paris, believes, according to a despatch to the New York *World*. The Cardinal is himself a radio enthusiast and has a receiving station in the Archiepiscopal Palace.

"I find wireless most interesting," he said, "but broadcast sermons cannot be expected to convert any one. Wireless is too dry and cold to have an effect. I have listened to wireless speeches by famous orators and admired their fine phraseology and style, but they left me unmoved.

"Personal magnetism is lacking. A speaker conquers his audience by the eyes, gestures, intonation, personality. If wireless ever transmits simultaneously with the words a living image of the orator, then I may revise my opinion."

Horoscopes Read by Radio from WOR

BELLE BART, astrologist, who has foretold accurately many important events and who is well known to readers of the leading newspapers in this country, will broadcast from WOR, Newark, N. J., every Monday evening at 9:15 p. m. Members of the radio audience desiring to have their horoscopes read can have this done by writing to Belle Bart giving date of birth and initials and three questions they desire answers to.

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Ace Model V
$20
Formerly known as Crosley Model V-c

This one tube receiver is astounding the radio world with its wonderful achievements. Stations more than 1000 miles away are being regularly copied on this set. In comparison to its price, there is no receiver on the market today to equal it in performance.

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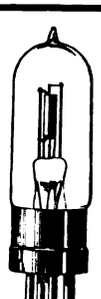

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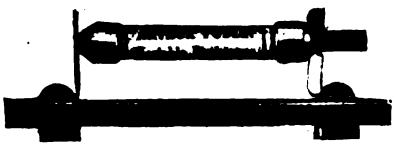

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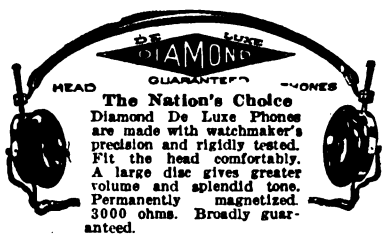

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250-watt, 1000-volt Westinghouse Motor Generator Set, reported heard in Texas, Kentucky, Maine and Missouri.

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Effect of Storm on Aerial

As an illustration of how an aerial acts in a storm, a writer in the New York Globe recounts a personal experience at a summer camp where the antenna system was the highest and most conspicuous thing for miles around. Soon after midnight one August morning, a most terrific electrical storm broke out. It was of such violence that for the first time in his radio experience the writer feared that the aerial would be struck. Half a dozen bolts struck trees all around the camp, some as close as four hundred yards, yet the high wires were not even touched! When the storm had abated somewhat the writer ventured forth and carefully touched the lightning arrester and the lead wires; they were positively hot, which shows that the aerial was actually grounding the heavy atmospheric charges.

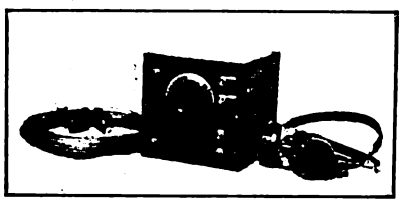
Radio Develops a Mean One

Smith—Jones has been tormenting me since he left for Cuba. If it's meant for a joke, it's a poor one.

Canford—What's he been doing?

Smith—He's been sending me radio messages stating: "Please find inclosed two cases of Scotch."—New York *Sun*.

The Radio (Trade Mark) Flivver



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	List	Special Price
Code Practice Sets (key, buzzer and switches mounted on attractive base)		$1.75
Three Coil Honeycomb Mounting	$4.50	3.25
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STANDARD VARIABLE CONDENSERS:		
21 plate, with vernier, knob and dial	$5.00	$3.75
41 plate, with vernier, knob and dial	6.00	4.20
Standard Variometers 150-750 meters	5.50	3.75
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Standard Hydrometer	.75	.55
Standard Rheostats	1.00	.60
Antenna Equipment (complete in box)	7.50	4.95

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The newest and most startling development in radio

Exceedingly Selective. Simple to Operate. Highly Sensitive. Verified C.W. Range of 1200 Miles. Telephone Range of 2400 Miles. Complete Parts for This Circuit.

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Include the following:

1 Special Coil	3.25
2 Variable Condensers (Bakelite Ends)	3.00
1 Socket (Genuine Condensite)	.50
1 Vernier Rheostat (Cutler-Hammer)	1.30
1 Panel (Genuine Bakelite), 7 x 18	2.50
1 Grid Condenser, Mica Dubilier .00025	.35
1 Switch Lever, 7 Points, 2 Steps	.31
8 Binding Posts	.40
1 Grid Leak (Cartridge Type) and Bakelite Holder	.60
2 Dials, 3 Inch	.50
Total	$12.71
One Stage Amplifying Unit to This Set, Additional	$5.00
Two Stages, Additional	11.00
Cabinets, Piano Mahogany Finish, One Bulb Set	$3.75
Two and Three Bulb Set	4.75

Complete Parts for Flewelling and Reflex Circuits.

U. V. 200 Tubes	$3.95
DeForest DV6A. Wonderful as an amplifying tube	6.00
22½ Volt "B" Battery	.89
Nathaniel Baldwin Type C, Double Phones	8.50
Nathaniel Baldwin Type C, Single Phones	4.50
Brandes (Superior) Phones	5.95
45 V. "B" Batteries (each)	2.25

All orders must be accompanied with a money order postage included.

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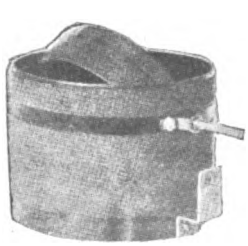
Following are a few of the many DX stations received with this **COAST COUPLER**, and detector tube only, at Long Beach, California:

PWX, Havana, Cuba **WDAP, Chicago, Ill.**
WWJ, Detroit, Mich. **CFCN, Calgary, Can.**
WSB, Atlanta, Ga. **WBAP, Ft. Worth, Texas**
And Many More.



Only one hook-up will do this. Only one tube is necessary if this Coast Coupler is used.

Coast Coupler and diagram mailed within the United States upon receipt of Five Dollars.

Satisfaction or Money Back Guarantee.

Make All Remittances Payable to

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Staten Island Residents Form Men's Radio Club of Richmond Borough

A GROUP of radio enthusiasts of Staten Island, N. Y., has recently organized the Men's Radio Club of Richmond Borough. It is an outgrowth of the Castleton Community Council and meets every week in Public School No. 29.

Membership in the club is restricted to residents of Staten Island, 18 years of age or over. A Junior Club, under the supervision of the Men's Club, is in process of formation. Its membership will consist of residents under 18 years of age.

Much interesting work has been laid out for the future in the form of lectures, experimentation and entertainment. "Untechnical Talks on Technical Subjects" have already been given by C. A. Stephen and H. Luyre.

The officers are: President, C. A. Stephen; vice-president, Rudolph Neumann; secretary, F. H. Horenburger; treasurer, H. Luyre; librarian, T. Norton. With all of Richmond County to draw from, a large membership is anticipated.

Important Decision Favors Public Utility Companies

RATES for public service corporations which fail to take into consideration the cost of reproduction at prevailing prices will not be approved by the United States Supreme Court as now constituted. Justice McReynolds delivered such a decision last week in a suit brought by the Southwestern Bell Telephone Company in Missouri.

"It is impossible," the majority opinion of the court said, "to ascertain what will amount to a fair return upon properties devoted to public service without giving consideration to the cost of labor, supplies, etc., at the time the investigation is made."

The Indoor League Likes Radio Sermons

RADIO has invaded the country grocery store. Round-the-stove conferences once devoted to the discussion of national political issues have been suspended in favor of radio broadcast entertainment, addresses and sermons.

A sermon delivered by the Rev. Dr. Philip Frick, pastor of the First Methodist Church in Schenectady, N. Y., was broadcast by WGY, the General Electric Company station. Dr. Frick received the following letter from "Bill" Davenport, of Hillside Farm, Jefferson, New Hampshire:

"You will see by the heading of this letter I am way up in the White Hills, right under Mount Washington. Today, Sunday, I had occasion to go to the store of F. O. Giddon and while there I heard a sermon preached by you which I enjoyed very much. In fact, it is the first one I have heard in 35 years. So you will see I am not much of a churchgoer, and to think you, away off in New York, should be the first one to catch me. The sermon was very distinct and the singing was fine. In our little town we have three churches, but there are quite a few of us old hardshells who rather go to the store and discuss whatever has transpired through the week. I just wish you could have looked in on the bunch while you were preaching. We were all held spellbound. You could have heard a pin drop anywhere in the room. Hope you will not think we are all heathens up here in the mountains. I should be very glad, if you ever came this way, to have you for my guest for a few days. Hope I may be able to hear another one of your sermons."

MAKE YOUR SET A VACATION SET

Reduce STATIC and other interference by using

(Pat. Pending)

The Short Cut Antenna is so arranged that it can be made a part of your set, either by being mounted on the panel or elsewhere. It replaces loops, aerials, electric light plugs, etc. Eliminates lightning dangers. Brings clearer signals and truer tone. Works on all standard vacuum tube sets.

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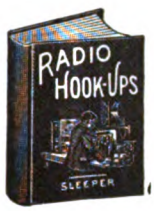

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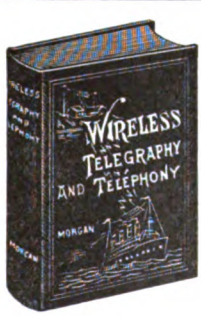

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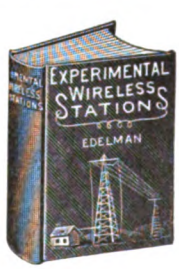

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The FADA "ONE SIXTY" neutrodyne circuit receiver will consistently bring in broadcasted programs from stations one thousand to fifteen hundred miles distant, with good volume using a loud speaker.

Log records for the evening of May 16th, and under the new broadcasting wave length regulations, listed thirteen stations received with loud speaker intensity. Selectivity between stations very good.

STATION		DIAL 1	DIAL 2	DIAL 3
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WHN	New York, N. Y.	0	31	29½
WGY	Schenectady, N. Y.	10	35	33
WDAR	Philadelphia, Pa.	12	36	34
WOR	Newark, N. J.	20	40	40
WBZ	Springfield, Mass.	22	24½	23
WGM	Atlanta, Ga.	28	49	49
WJAZ	Chicago, Ill.	31	53	51
WJY	New York, N. Y.	35	55	55
WEAF	New York, N. Y.	45	64	64
WOO	Philadelphia, Pa.	49	71	69
WCX	Detroit, Mich.	54½	72½	74
KSD	St. Louis, Mo.	60	84	84

The wave length range of the FADA "ONE SIXTY" allows reception from broadcasting stations in every part of the country. Arrange to have your local radio merchant demonstrate the "one sixty" in your own home.

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~ WITH THE NEUTRODYNE CIRCUIT ~

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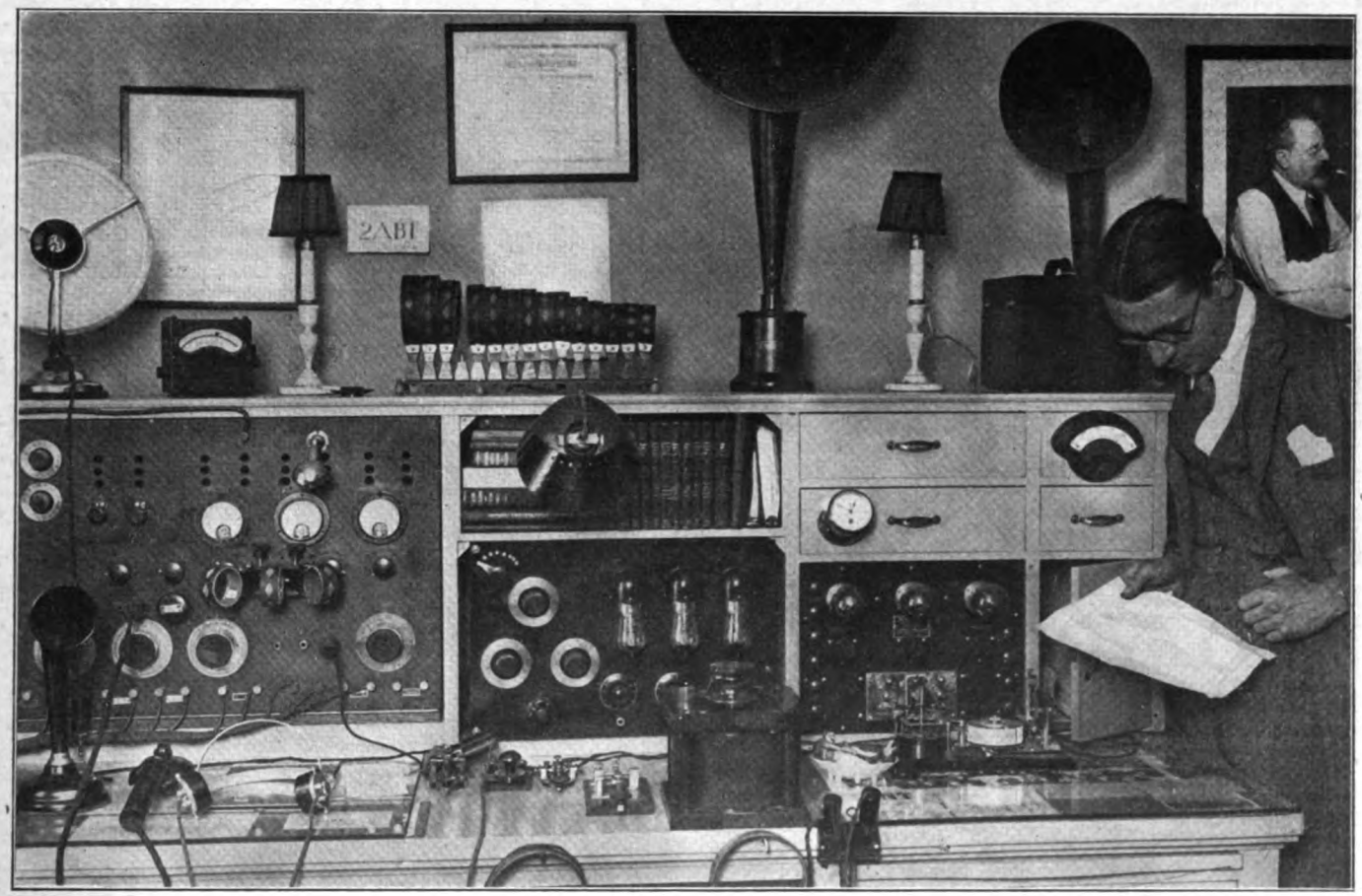

(C. Kadel & Herbert)

George Freisinger, of New York City, is the owner and operator of this splendidly equipped amateur station. As will be noted, the apparatus is mounted on a specially made desk and its arrangement is compact and convenient. The complete equipment is said to have cost $5,000. The station is described on another page of this issue.

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Exceedingly Selective. Simple to Operate. Highly Sensitive. Verified C.W. Range of 1200 Miles. Telephone Range of 2400 Miles.

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2 Variable Condensers (Bakelite Ends)	3.00
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1 Vernier Rheostat (Cutler-Hammer)	1.30
1 Panel (Genuine Bakelite), 7 x 18	2.50
1 Grid Condenser, Mica Dubilier .00025	.35
1 Switch Lever, 7 Points, 2 Stops	.31
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1 Grid Leak (Cartridge Type) and Bakelite Holder	.60
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Total	$12.71
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GRAND RADIO CO.
1789 Third Ave. 1714 Second Ave.
NEW YORK CITY

When Your Set Goes on Strike

SOMETIMES your set for no reason at all just lays down on you and goes out of commission, or stations that pounded in last night are weak and faint tonight. What do you generally do? Go through your set with a fine comb or sit and test out carefully?

What you should do is this: Look at your antenna thoroughly and inspect your ground and lead in. It may be that your antenna has become grounded or that your ground lead is broken or loose. Look at your B battery. They sometimes take a sudden drop in voltage and hence your tubes are not working right. Inspect your tubes. Once in a while the lead nipples on the lugs corrode and form a high resistance path for the current which is equivalent to a bad connection. Examine your phone cords. There may be a break in the tinsel and you need a new cord. In order to test them, turn on your tubes, put on your phones and carefully "feel" the cord, an inch at a time, bending it back and forth. If there is no sudden increase in the strength of the signals the cords are O. K. Never test phones with a battery. Examine all your flexible connections, such as the pig-tail connections on your condensers and couplers.

If all these things seem to be right, carefully inspect the set looking for corroded connections or crossed leads. It stands to reason that if the set worked all right the night before, and no one touched it during the day, that it did not walk around and break itself and that there is only some minor trouble, which can usually be found outside of the cabinet. There is no use to get all worked up and go fishing around inside the cabinet and do more damage than originally caused your trouble.

Germans Radio to Moving Trains

GERMANY recently had a demonstration of wireless telephonic communication between a moving train and ordinary receiving and transmitting stations, according to Consul Richardson at Berlin. Messages were exchanged between the president and officials of the government in Berlin and other officials on a train moving at 30 miles an hour, half-way between Berlin and Hamburg, by means of the "Huth" system. This system is a combination of wireless and wire transmission. The sending apparatus was installed in a compartment on the train and the antenna rigged over the tops of two cars. The line telegraph wires along the track are said to have picked up the messages and transmitted them to Berlin where the line was connected with a receiving set.

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FOR a surprisingly small sum you can now build a real receiver that is surpassed by none in either efficiency or artistic appearance. In a beautifully designed cabinet are a series of instruments that co-ordinate to give an ease of control, long distance reception and elimination of interference which will win the instant approval of the most discriminating. The old reliable regenerative hook-up is used with a wave length range of 150-3000 meters.

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 11. Whole No. 63 | **June 9, 1923** | **15c. per copy, $6.00 a year**

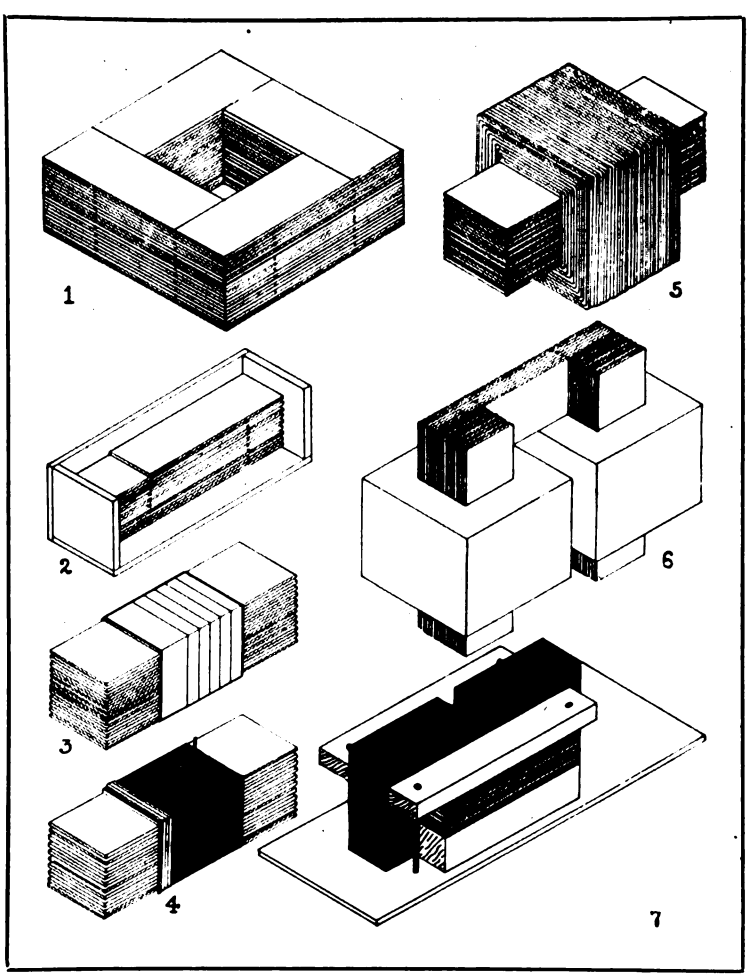
How to Build a Battery Charger for Use with 110 Volts A. C.

By Stuart A. Hendrick 2BJG

ALMOST every one who owns a storage battery wished, at some time or other, that he had a means of charging it just where it stands instead of lugging it off to a battery charging station every time it runs down.

There are numerous charging outfits on the market. The electrolytic or chemical rectifier is very unhandy, unclean and cannot be relied upon to do a good job. It will, in all probability, do more harm than good to your battery. The magnetic type of rectifier is noisy and cannot be relied upon as much as a Tungar, which will be described in this article and, in my opinion, by far the best to use with 110 volts A. C. It is noiseless and is the only one that can be absolutely depended upon to do the charging because it has no moving parts to get out of order and no chemicals to evaporate and give off fumes.

The prices of these rectifiers range from $15 to $30 and quite a part of this sum may be saved by building the rectifier yourself. While some persons have not the patience or facilities for building apparatus of this type others manage to do these things and any one who undertakes to build one of these Tungar rectifiers will find, when he has finished, that he has not only saved considerable money but has a piece of apparatus that is about the handiest thing possible to say nothing of the knowledge gained while obtaining the parts and building the rectifier.



Figs. 1-7. Progressive steps in making the double-wound transformer for use with the battery charger. Each step in the construction is fully explained in the accompanying article.

The Tungar works essentially upon the same principle as the vacuum tube in your receiver, but the bulb is especially built to stand the heavy current that must be passed through it.

The rectifier consists of a transformer which supplies a low voltage for lighting the filament of the special Tungar bulb. The transformer also supplies a higher voltage which is rectified through the bulb and used to charge the storage battery. The transformer will work only when connected to a source of alternating current at a potential of 105 to 115 volts.

There are two sizes of this type of rectifier—the two ampere and the six ampere.

The two ampere size is suitable for changing small batteries of from 10 to 40 ampere hours capacity. This size will be just the one for those who do not discharge their batteries very often and are in no hurry to get them charged again as they will have to leave the battery in charge for quite a few hours in order to get the job done.

The bulb used in this outfit is known as a Tungar or Rectigon bulb and can be obtained from almost any dealer in radio supplies at a cost of $4 for the two ampere bulb.

Obtain one of these bulbs and also get a porcelain base socket to fit it. The socket should be such that when it is fastened to a baseboard the bulb will be in

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an upright position, otherwise the filament will sag when it is heated up and will not operate as it should nor last as long as it ought if used properly. Do not, by any chance, put this bulb in a lighting socket, just because it happens to fit, as it will burn out the bulb and probably blow the house fuses.

The next thing needed is a step-down transformer having a two volt secondary capable of delivering 10 amperes and a 15 volt secondary capable of giving two amperes. The two volt secondary is used for lighting the filament of the rectifier tube while the 15 volt winding furnishes the alternating current to be rectified by the tube and to be used for charging the battery.

As very few will have a transformer on hand to meet these requirements, one will have to be constructed according to the following data:

With any transformer the core is the first consideration and when making a transformer, for amateur use, the only dimensions of importance are the height of the strips or laminations when piled up, as well as the width of them; in other words, the cross-section of the core. The length of the legs or sides depends on the size of the coils to be wound upon them, so they should be made long enough to leave plenty of room for the windings to fit in.

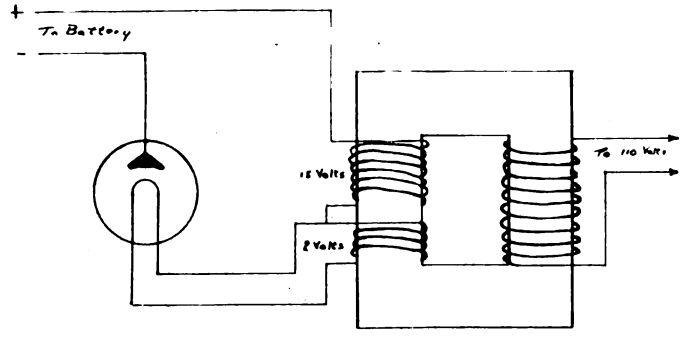

Fig. 8. The way in which to connect the transformer up after making it. Watch your connections on the filament. If the wrong winding is connected you will burn out your tube.

The core used in this outfit was made of strips of silicon steel or transformer iron 1¼ inches wide and piled up to a height of one inch. The sizes were five inches long, which left enough room for the coils.

The core may be obtained from any company that manufactures transformers, for two or three dollars at the most. However, quite a few of you may desire to make the core yourselves.

If silicon steel cannot be obtained, ordinary black stovepope iron may be used and should be about .016 inches in thickness (about 60 thicknesses to the inch).

If this ordinary iron is used in making the core, the cross-section will have to be increased until it is twice as large as that used with the silicon steel because of the lower permeability of the black iron. This will make the core 1¼ inches by two inches instead of 1¼ inches by one inch. The length of the sides will remain the same in either case, that is, five inches wide by five inches long. Any tinsmith will cut it into strips of the proper width for a nominal sum or you may do this yourself if you have a pair of tinsnips and a little patience.

After enough of the pieces have been cut up to the proper size, 1¼ inches by 3¾ inches, they should be piled up as shown in Fig. 1 in order to find out if the corners fit together all right. The next thing to do is to make a wooden frame as shown in Fig. 2 so that the legs upon which the coils are to be wound may be piled up evenly and clamped. As each piece of iron is laid in place it should be given a good coat of shellac. When all of the pieces for one leg have been shellaced and piled up, a piece of wood is put on top of them and clamped down until the whole thing is thoroughly dry after which, when it is taken out of the frame, it will be found to be a solid piece with the shellac holding it together. It should then be taped up as shown in Fig. 3. Two legs should be made up in this manner and when they have been finished the coils should be wound upon them as shown in Figs. 4 and 5. The end of the wire should be fastened as shown in Fig. 4 in order that the winding shall be held securely in place. Plenty of shellac should be applied while winding the coils and when they are finished they should be given an additional coat and placed in a hot oven and thoroughly baked until dry.

The primary coil, or the one that is connected to 110 volts alternating current, is wound upon one of the legs and consists of 605 turns of No. 20 double cotton wire. This winding should be put on evenly and shellaced as shown in Fig. 5. The two secondaries are wound upon the other leg after it has two or three layers of tape on it. The 15 volt winding is put on first and should consist of 85 turns of No. 18 d.c.c. wire. The filament winding is made up of 11 turns of 14 d.c.c. wire wound on top of the 15 volt sceondary.

When these two legs have been wound, shellaced and baked they should be stood on end and the pieces that are to make up the sides should be inserted one at a time until the side is built up as shown in Fig. 6, after which the whole thing should be turned over and the other side put in place in the same manner. The transformer should be given another coat of shellac and place in a box or clamped in a frame of wood or iron to keep the laminations of the core from humming while it is in service. One way of mounting is shown in Fig. 7. The bulb should, in all cases, be exposed to the air so as to keep it cool because it develops quite a bit of heat while in use.

The method of wiring up the outfit is shown in Fig. 8. The wire marked negative goes from the anode of the tube to the negative side of the battery.

The operation of the outfit is as follows: The two volt winding keeps the filament incandescent while the fifteen volt winding supplies the alternating current of which only one-half passes through the bulb which acts as a valve, thereby supplying a pulsating direct current which is suitable for battery charging.

A blue glow will be seen directly above the filament when the rectifier is connected to the battery and is working properly. If the blue glow fails to appear, the end of the fifteen volt winding should be connected to the other side of the filament instead of the side it happens to be on. If then the blue glow fails to appear, the filament should be lighted more brightly by adding a turn or two to the filament winding or by adding more turns to the 15 volt winding to get a higher voltage.

This little rectifier consumes about 50 watts—filament 20 watts, copper and iron losses 20 watts and the charging current takes about 10 or 12 watts. Although the efficiency is not very high the cost of charging is considerably lower than the cost of having the battery charged at a battery station. A six volt 60 ampere hour battery will only cost about 12 to 15 cents to charge, including depreciation of the bulb. With careful handling a bulb will last two or three years. The rectifier may be used with any six volt battery.

With the foregoing data any one ought to be able to construct this rectifier which certainly will be a most useful piece of apparatus.

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An Interesting Amateur Station Is 5ZA, Roswell, New Mexico

AN amateur owned and operated station well known in this country and which has the distinction of having been heard in England, Switzerland, Hawaii, Panama, and Porto Rico on an input of only 400 watts is that of Louis Falconi. The station is listed under the call 5ZA and is located at Roswell, New Mexico.

The station, both receiver and transmitter, were made by the owner who describes his apparatus as follows: The transmitter is a combination phone, CW and ICW set with a maximum output of 200 watts for CW and 100 watts when phone is being used. Two five watt speech amplifiers are employed when the set is used as a phone transmitter. Referring to the illustration, the transmitter is located on the right hand side of the table. At the top of the panel is located a thermo-couple radiation meter reading from 0-10. Directly under the meter is the opening for the four tubes. These tubes are mounted directly back of the opening on strips of rubber to prevent all vibration or microphonic noises when the set is in operation. The switch handle under the openings controls a multiple switch for changing the circuits from CW to phone. This is quite a difficult task when it is considered that all the circuits have to be changed as there are speech amplifiers in the phone circuit. The meter at the right center of the panel is for indicating the total plate input on all tubes, while that opposite it is for indicating the plate input on the speech amplifiers. The remaining meter is for indicating the filament current. An anti-capacity switch throws this meter from the power tubes to the speech amplifiers, the power tubes operating best at 10 volts and the speech amplifiers taking 7.5 volts. This switch is located in the center of the panel. The jack at the lower center controls the filaments of the speech amplifiers as well as allowing the microphone circuit to be switched on or off at will. When the microphone jack is plugged in, the filaments of the speech amplifying circuit are automatically switched on. The two handles on either side of this jack control the rheostats one for the primary of the filament transformer and the other the filament of the speech amplifying tubes themselves for fine regulation. As the amplifying tubes use less current than the power tubes, it is necessary to have a separate rheostat for them alone. Two double pole switches control the plate circuit current (1,000 volts D.C.) which is generated from 110 volts A. C. The small panel at the right of the transmitter contains the wave length control and on the panel is a variable inductance and a condenser in series with the antenna. Either of these may be shorted if necessary. The switchboard for the motor-generator control and filament transformers is located directly under this panel, and all connections are made as simple as possible.

The receiving unit is a combination long and short wave set, embodying several unique and original features. It can be used as either a double or single circuit. As the double circuit it uses the regular variometers and couplers. For each circuit there is a separate detector and each can be used with either two steps of audio- or two steps of radio-frequency amplification. In the single circuit set is used a bank wound coupler allowing reception up to 3,000 meters. This can be loaded with honeycomb coils and reception up to 20,000 meters is then possible. The top dial is for the coupling control and under it are the controls for the variable condenser, plate variometer, potentiometers, (two are used—one for control of the plate voltage and one as a stabilizer when the radio frequency amplifiers are in use). The honeycomb coils are used to load the single circuit set. There are six rheostats used, one for each tube (two detectors—one for each circuit). Filament control jacks are used throughout.

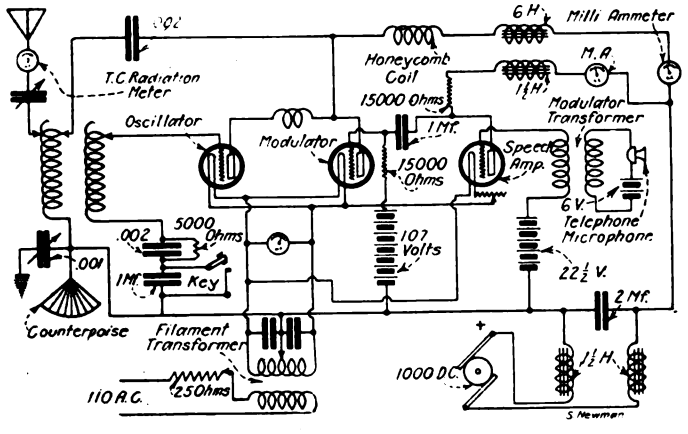

Fig. 1. Circuit diagram of the extremely efficient transmitter used at 5ZA and described in the accompanying article.

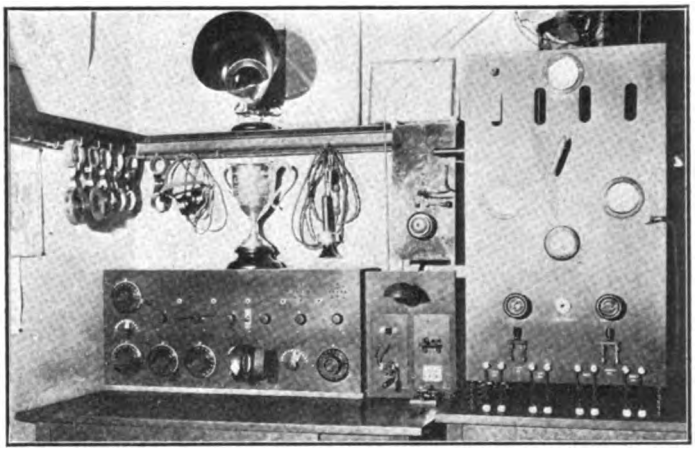

Fig. 2. Transmitter (right) and receiver (left) of Station 5ZA.

In the center of the panel is an anti-capacity switch which throws all the circuits from long wave single circuit to short wave regenerative double circuit. This change involves a transfer of radio-frequency detector and audio-frequency circuits as well as the antenna and ground connections. Capacity effects are nil in this receiver as the entire receiver is screened and grounded. A very valuable feature of the receiver is that in transmitting, by throwing the circuits to the long wave circuit side and tuning to a harmonic of the transmitted wave, a check may be had on the character of the tone and of the transmission.

Using this receiver amateurs in every district are heard nightly. Using the long wave single circuit UFT, POZ, NPO are heard constantly and broadcasters all over the United States, Canada and Cuba are heard.

A point of interest to amateurs is the Hoover cup, awarded during the contest in 1921, shown in the background of the illustration. This station took second place in 1922.

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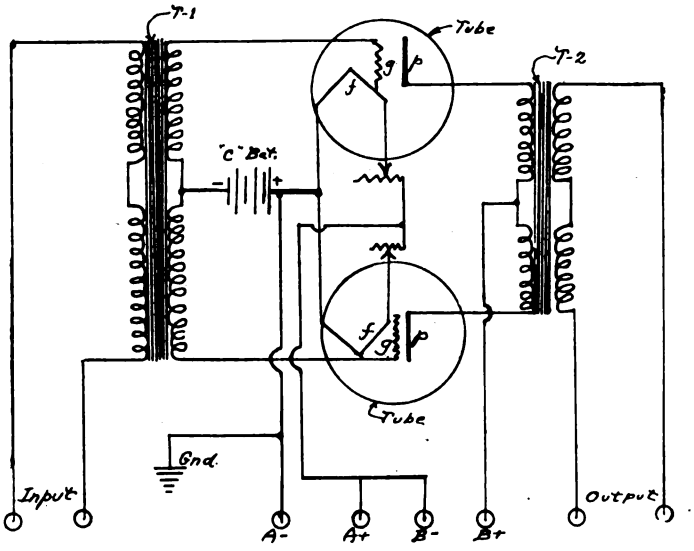
How to Make a Super Amplifier

By C. White, Consulting Engineer

WITH the coming of the warm weather many new radio troubles present themselves for our solution. The increase in the amount of atmospherics and the decrease in radio transmission efficiency makes it very necessary to resort to various types of amplification to get the same amount of volume that we have been accustomed to get in the winter months. The popularity of the many styles of loud speakers again emphasizes the fact that we are not going to cover our ears with phones all the time. Who can conveniently conceive a dance with phone receivers on our ears? Still this summer the popularity of radio music for dances in summer camps and hotels is certainly sure to come and means must be taken to see that ample amplification is available in order greatly to augment the weakened signals.



Schematic diagram for the construction of a power amplifier using two transformers of the push-pull type. This will give exceptionally loud amplification with little distortion.

It is a well-known fact that two stages of ordinary audio-frequency is generally looked upon as the reasonable limit to take that type of amplification. The reason that this point has been so fixed by custom is owing to the fact that when more than two stages have been employed all sorts of distortion is encountered. In fact, with some transformers a third stage of audio-frequency so distorts the music and voice that the reception is rendered wholly useless. The solution to the problem is the employment of push-pull amplification instead of the ordinary type of amplification for the second or third stages. It has been found that one stage of straight amplification and then one stage of push-pull type as explained in this article will render wonderful results in quality and volume. It is a well-known technical fact that the push-pull system of tube amplification will render more volume and quality than an equal number of tubes placed or connected in the ordinary method of transformer amplification. Then, again, the development of the new C-301A and UV-201A tubes has made it possible to design push-pull amplifiers that work satisfactorily without the use of power tubes. This is a great item for the summer vacationist who would find it rather inconvenient to lug around storage batteries and the large supply of "B" batteries such tubes required to work efficiently. With these new tubes dry cells can be used for filament lighting and if the amateur so desires he can use a smaller storage battery than he would need if large power tubes had been used. In addition he will find that two small 45-volt "B" batteries will last him many months more than the summer season. This style of amplifier can be used with or without one or more stages of straight amplification by means of the ordinary transformers.

The general schematic connections are clearly shown in the illustration herewith. Two push-pull types of transformers are used. A "C" or grid bias battery of 4.5 volts is recommended when UV-201A tubes with 90 volts plate potential are employed in the circuit. A separate rheostat is furnished for each tube in order to make it possible to adjust the two tubes to the same operating point on their characteristics. The method of adjustment is to remove one tube from the amplifier and adjust the remaining one for maximum volume Then replace the other and remove the first tube, and repeat the operation until the same amount of volume is heard. The adjustment is effected by the control of the filament rheostats to each tube. After these adjustments have been made both tubes can be placed in the sockets and the amplifier is ready for operation. These rheostat settings should not be changed and the amount of volume should be varied either by turning down the detector or a previous tube in another stage of amplification. Of course, if the volume continues to remain too high for all occasions then another adjustment can be made, but for just momentary changes in volume it is better to accomplish the same as previously explained.

Now comes the "where to buy" situation. The tubes, rheostats, sockets, and batteries are indeed quite easy to procure, but the purchase of the desirable transformers for push-pull work cannot so easily be manipulated. After you look around a little, I shall be very glad to assist any one in finding a place where the transformers can be accurately made to order at a most reasonable cost, about $12.50 for the pair. If you should desire to write me concerning this, address me in care of RADIO WORLD, enclosing a self-addressed envelope with your letter, and I will see that your letter is forwarded to the right party. I wish fully to emphasize the fact that this is by no means a marketing scheme, because if you are able to get what you want in your home town it is much better in many ways that you patronize your favorite dealer. Let me again emphasize the fact that this complete outfit can be readily built for less than $50, and the cost for an amplifier working on the same principle would cost many times that figure. When you first use this type of amplification you will be more than surprised at the amount of volume without distortion that can readily be obtained from two tubes. It is indeed a great pity that many amplifiers built upon this type are not in more common use. It is often the case that the distortion that we are so wont to blame on the loud speaker in reality originates in the amplifier. Please note the fact that with this style of circuit the direct current plate potential supply does not in any way pass through the loud speaker windings. This fact not only means less distortion, but also means that the loud speaker winding is fully insulated from high voltage and burn-outs resulting from short circuiting the same through the coils.

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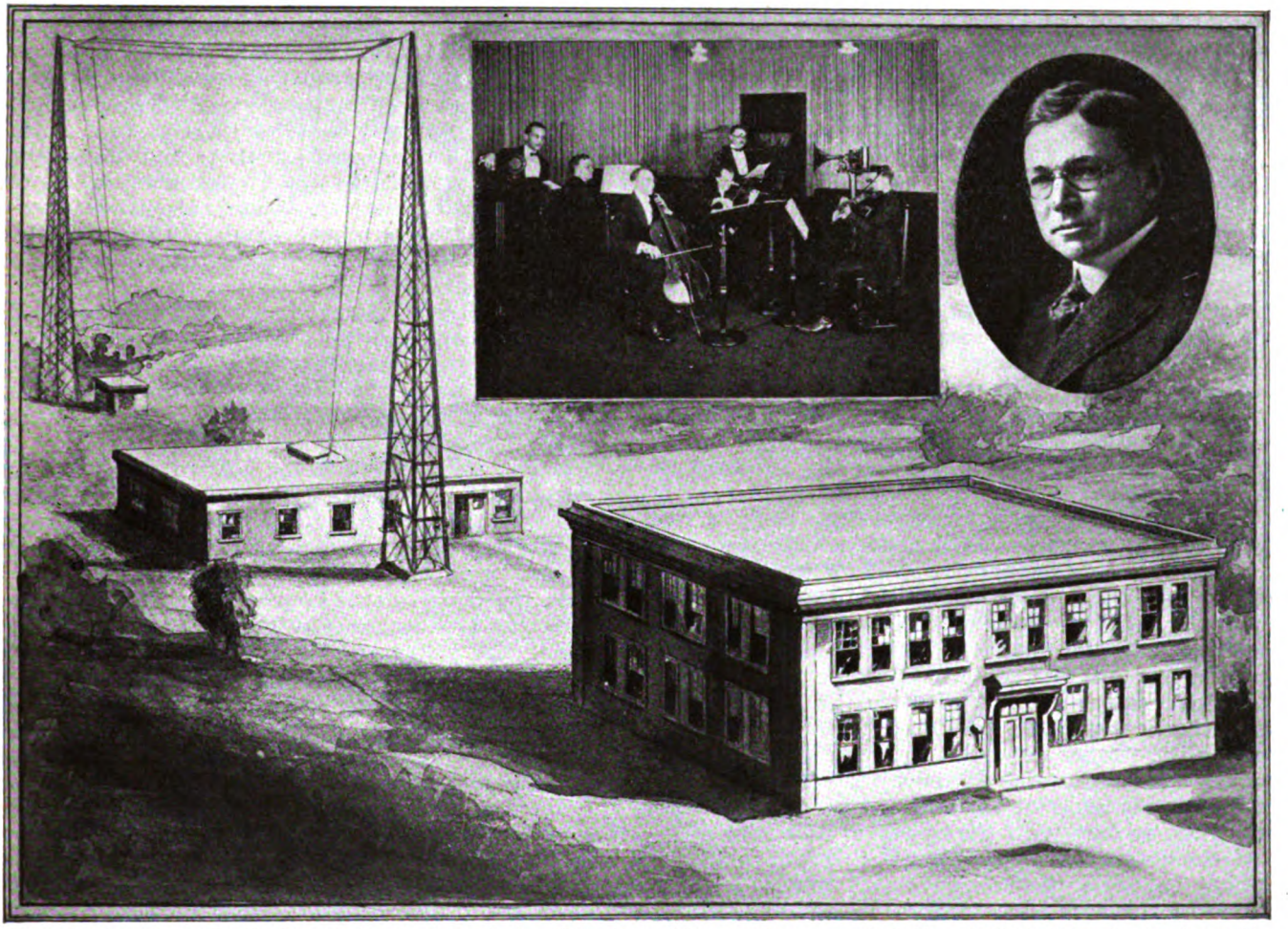
A New Pacific Coast Broadcasting Station

By C. H. Huntley

FAITH in the permanence of radio broadcasting is demonstrated by the announcement of the General Electric Company that the first plant to be constructed exclusively for popular broadcasting will be erected in Oakland, California, to house the large Pacific Coast station of that company.

Work will be started this month on a two-story studio building, the antenna towers and the power house. Workmen are already assembling the radio equipment. It is expected that the new station will be on the air within six months.

and quarters for motor-generator sets and storage batteries. There will be two studios on the second floor, the main studio large enough to accommodate large bodies of musicians such as a band or symphony orchestra, and a smaller studio from which solo numbers and addresses may be broadcast. The use of two studios will make possible continuous broadcasting. Research is now being carried on to determine the reverberating qualities of the ideal studio in order that the proper amount of dampening may be secured in the Oakland studio to assure maximum musical quality. The radio control room will be on the second floor.



Wash drawing of new Pacific Coast Radio Broadcast Station of the General Electric Company to be built at Oakland, California, showing studio and office building, power station and antenna. Insert in center shows how the studio will look and to the right is a portrait of Martin P. Rice, Director of Broadcasting of the General Electric Company.

Martin P. Rice, director of broadcasting for the General Electric Company, will direct the operating policy of the station and Dr. Thomas Addison, manager of the company's interests on the Pacific Coast for the past thirty years, will have supervision of the plant.

The station will be located on East 14th Street, Oakland, adjacent to the new General Electric Company factory building. The site was selected after a thorough inspection of available properties in San Francisco and vicinity. The Oakland plot was chosen because of its technical advantages, the availability of musical talent, and the proximity of the site to San Francisco, the great commercial center of the Pacific Coast.

The plans provide for a two-story brick structure. On the first floor will be the office of the studio manager, a general correspondence room, a reception room for artists

One thousand feet back of the studio building will be the power house and antenna system. The antenna will be multiple-tuned and strung between two steel towers, each 150 feet high and placed 260 feet apart. Beneath the antenna proper will be the counterpoise consisting of a network of wires, fourteen feet above the ground, covering an area of 150 to 300 feet. In addition to the power house, which will be one story high, 71 by 32 feet, there will be a small building for the tuning apparatus and the end of the multiple-tuned antenna.

The transmitting set will be similar to that which is now heard almost nightly from WGY, Schenectady, N. Y., and the many developments which have brought this station a reputation for exceptional transmission quality will be part of the Pacific Coast station equipment. The apparatus is

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The Interdepartment Radio Advisory Committee Organized for the Government

THIS committee had its origin in the First National Radio Conference called by Secretary of Commerce Herbert Hoover which met from February 27 to April 19, 1922. In connection with the assigning of wave length bands for government radio broadcasting it became apparent that there would have to be agreement among the government departments as to the use and distribution of the wave lengths in the government bands. A certain amount of broadcasting was being done by several departments, with little or no co-ordination. An extensive daily program of broadcasting market and crop reports was being transmitted for the Department of Agriculture by seven continuous-wave stations of the Post Office Department. This development was begun in December, 1920. Weather reports and hydrographic news have been broadcast from 30 radio telegraph stations of the Navy Department since 1905. Broadcasting was being done in an experimental way by some other government stations.

On April 24, 1922, Secretary Hoover invited each of the ten Departments of the Government to name a representative on a permanent committee to co-ordinate the radio broadcasting of the Government. As the Chief Co-ordinator, Bureau of the Budget, had also drawn up a plan for a co-ordinating radio committee, a representative of the Chief Co-ordinator was added. Subsequently representatives of the Shipping Board and the Interstate Commerce Commission were added. Thus the committee now includes representation from every part of the government that has any substantial interest in radio.

In the beginning the committee dealt only with broadcasting. Various problems arose which indicated the desirability of extending the scope of the Committee to include a wider field than radio broadcasting. On December 15, 1922, the committee voted to recommend to the Secretary of Commerce that he take action to extend the scope of the committee to include all matters of government radio communication. This was done by the Secretary of Commerce with the concurrence of all the other departments. The scope of the committee's activities was stated by the Secretary of Commerce in his letter of January 5, 1923, to the other departments, to be "with the approval and participation of the interested departments, to cover matters pertaining to radio communication in general. The functions of the committee are to remain purely advisory....to all the participating departments in matters coming under its cognizance."

The chairman of the committee is Acting Secretary S. B. Davis of the Department of Commerce, who serves as the representative of that department on the committee. The committee membership also includes representatives of the following departments and independent establishments: Department of Agriculture, Bureau of the Budget, Office of Chief Co-ordinator; Department of the Interior, Interstate Commerce Commission, Department of Justice, Department of Labor, Navy Department, Post Office Department, U. S. Shipping Board Emergency Fleet Corporation, State Department, Treasury Department, War Department.

The committee has the following standing subcommittees: Subcommittee on Material for Broadcasting, Subcommittee on Operating Procedure, Subcommittee on Technical Problems, Subcommittee on Mobile Radio, Subcommittee on Government Radio Policy and Legislation.

The committee began in 1922 an experimental system of "primary" broadcasting stations for the transmission of official government news by continuous-wave (code) telegraphy, this news being available to approve privately owned broadcasting stations for re-broadcast by radio telephone. Use has been made solely of previously existing stations. Seven Post Office Department (Air Mail) stations were used at the outset and have been replaced by the following navy stations, working on frequencies between 50 and 65 kilocycles (between 6,000 and 4,600 meters); Arlington, Va., Great Lakes, Ill., New Orleans (Algiers), La., San Francisco, Cal. These primary stations accomplish the same purpose as leased wires in supplying material to the radio telephone broadcasting stations.

There is one government radio telephone broadcasting station, that at Arlington, Va. Its frequency, under the new assignments, is 690 kilocycles (435 meters). It broadcasts lectures, market news and miscellaneous information, supplied by the Departments of Agriculture, Commerce, Interior, Labor, and Treasury, and also music by government bands. The schedule includes eighteen 15-minute periods of radio telephone broadcasting daily.

The character of material, schedules, and procedure for both primary and radio telephone broadcasting are approved by the Interdepartment Committee. About 100 privately owned broadcasting stations are supplied with material from several Departments and authorized to broadcast it by radio telephone.

It is impossible to state the cost of broadcasting by government departments because such operations have been conducted in connection with the other regular radio work of the departments. The figures given here represent simply an apportionment of cost or additional cost to the departments concerned. The cost of conducting the broadcasting by government stations during the past year included $13,800 for equipment at navy stations (including installation, alterations, power and renewals). There was no equipment charge against broadcasting by the Post Office Department stations; the operation cost at the Post Office Department stations was approximately three cents per word. The average cost of the broadcasting from all seven Post Office stations for one day on a fifteen-hour basis was $53.93. This was 19% of the total cost of operating the Air Mail stations and amounted to $16,826 per year. The committee has no estimate of the operation cost of the broadcasting from navy stations, nor of the cost of preparing the material in the departments furnishing the material.

The committee has carefully considered the classification of material for broadcasting. The committee has adopted the principle that radio broadcasting should not be used where wire telegraphy or telephony or printed publication would be as satisfactory.

One of the chief functions of the committee is coordinating the services and equipment of the radio stations operated by the several departments. The committee has made a complete survey of the equipment and service of all these stations and has assigned new frequencies (wave lengths) to them to accord with the recommendations of the Second National Radio Conference. The committee's work is bringing about more uniformity in types of equipment used.

The several departments feel that the committee has been a satisfactory clearing-house for government

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Simple and Easily Made Neutrodyne Condensers

By J. E. Anderson

EVER since Prof. Hazeltine introduced his neutrodyne receiver there has been a demand for small variable condensers that may be used in the construction of such receivers. None of the ordinary vernier condensers on the market has a capacity sufficiently small to meet the demand, as their minium capacity is approximately what the maximum should be for neutrodyning the ordinary amplifier. The capacity required is of the order of one micromicrofarad.

Two wires placed near each other without touching form a condenser of very small capacity. If they are at right angles to each other the capacity is minimum and if they are parallel it is maximum. The capacity may either be varied by turning one with respect to the other or by varying the distance between them. It may also be varied by varying the length of the parallel portion. One of the simplest variable condensers of the parallel wire type is obtained by twisting two insulated wires together. The capacity is increased or decreased by twisting or untwisting the wires. The insulation of this wire should not be too thick or it would be required to twist too much wire together to obtain sufficient capacity. Enameled or silk covered wire is suitable. The capacity of such a condenser may be calculated, but the formula is too complicated for easy application and the right amount is found much more readily by trial. A pair of No. 20 double silk covered wires would have a capacity of about one-tenth micromicrofarad per inch.

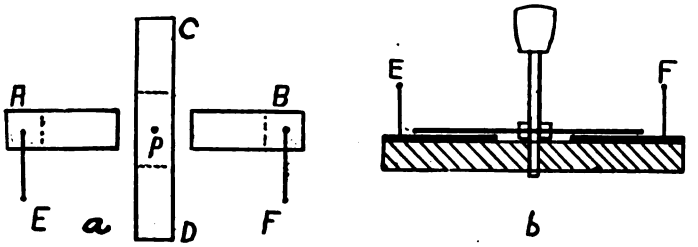

Fig. 1. Diagrams showing how a simple variable neutrodyne condenser can be made. Full instructions are given in the accompanying text.

Another condenser that may be easily constructed is shown in Fig. 1. A and B are metal plates or pieces of foil securely fastened to a base of insulating material. CD is a movable metal plate or vane capable of turning about the pivot P. The plan for the condenser set for minimum capacity is shown in *a* and a section of it when set for maximum capacity is shown in *b*. If the effective width of the stationary plates and the moving vane is ½ inch and the effective length when fully engaged is 1 inch, the capacity as measured between the points E and F is approximately 3.6 micromicrofarads for a separation between the plates of 1/64 inch. It will be noticed that there are really two condensers in series and the total capacity is one-half that obtained by calculating one side. A condenser of this type has no sliding contacts and the dielectric is air. Furthermore it will not easily short-circuit, as if one side touches the other will probably be farther away.

In Fig. 2 is shown a condenser that requires a little more work to build but that will present a much neater appearance when completed. Two brass bars AB are securely fastened to an insulating base BB, preferably hard rubber, and are drilled and tapped to admit a couple of ordinary switch points P. One of these is fixed in a convenient position and the other is made movable by turning the knob K. If switch points with quarter inch heads are used, the capacity of the condenser when the plates are separated .005 inch is approximately two micromicrofarads. If a greater maximum capacity than this is required, small metal disks of the proper diameter may be soldered to the switch points. But these disks must be perfectly flat and must be mounted concentrically with the screw and at right angle to its axis. The drilling of the bars AB and the mounting of the switch points on these supports must be done very accurately to prevent wobbling of the plates. It is best to give the plates a coat of shellac or some other insulating covering to prevent short circuit when the plates are close together.

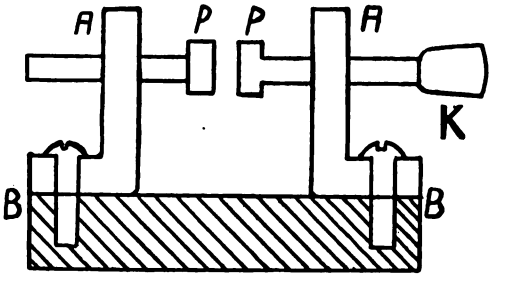

Fig. 2. Another type of neutrodyne condenser which can be constructed by the amateur desiring extremely small capacities.

A condenser of this type is capable of extremely fine variation in capacity. Its capacity is comparatively large when the plates are close and its rate of change with turning the screw is rapid. When the plates are far apart the capacity is almost negligible.

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radio matters. While the experimental broadcasting system has operated fairly satisfactorily to date, the experience which has been had with it should be used as a basis of a rational plan for a government broadcasting system. The question is, of course, intimately related with the existing and prospective privately owned broadcasting stations throughout the country. If radio is to become of maximum benefit to the people, the government must continue to study the question of properly organized radio broadcasting and other services. There are constant occasions for curtailments or extensions of the government's radio plant, and the committee's effort is to co-ordinate these needs and fulfill them with maximum economy.

The committee has functioned successfully as a body advisory to the Secretary of Commerce and to the other departments. There have been no disagreements for which a solution has not been found. The committee has been the means of bringing together the diverse needs and interests of the several departments, and has attained a recognized standing in the government administration of radio matters. It should, eventually, be able to establish an efficiency acceptable to taxpayers.

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Broadcasters Now Number 592

By Carl H. Butman

WASHINGTON, D. C.—Radio broadcasting stations total 592, according to the latest Department of Commerce survey. Of this number 113 are Class A stations, 36 highpowered Class B stations*, One—KDKA—designated as a broadcasting development station and the balance, 442, Class C operating on 360 meters.

Many old stations grouped temporarily as Class C and directed to operate only on 360 meters, have been reclassified as A stations and assigned special district waves. There remain 442 in this class either awaiting new wave lengths or satisfied to continue on 360 meters. New stations, however, are still coming in, about 30 being added in the last thirty days while 20 dropped out.

During the past week, four new A stations were licensed; one each in Pennsylvania and South Dakota, and two in Colorado. Fourteen C stations were transferred from Class C during the week ending May 26th.

*Note—See list of B stations in RADIO WORLD for May 14.

Four New Class A Stations Licensed

Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
WBBD	Barbey Battery Service, Reading, Pennsylvania	1,280	224	50
KFKH	Denver Park Amusement Co., Lakeside, Colo.	1,330	226	10
KFIJ	Thorean, Sidney I., Platte, S. D.	1,270	236	5
KFJD	Weld County Printing & Pub. Co., Greeley, Colo.	1,270	236	100

Fourteen Stations Transferred from Class C to Class A

Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
KDZF	Automobile Club of Southern California, Los Angeles, Cal.	1,080	278	500
WAAF	Chicago Daily Drovers Journal, Chicago, Ill.	1,050	286	200
KFZ	Doerr Mitchell Elect. Co., Spokane, Washington	1,060	283	5
WAAK	Gimbel Bros., Milwaukee, Wis.	1,070	280	100
WLAX	Greencastle Community Broadcasting Station, Greencastle, Ind.	1,300	231	5
WLAZ	Hutton & Jones Elect. Co., Warren, Ohio	1,210	248	10
WIAK	Journal Stockman Co., Omaha, Neb.	1,080	278	200
WEAG	Nichols Hineline Bassett Lab., Edgewood, R. I.	1,300	231	10
WIAD	Ocean City Yacht Club, Ocean City, New Jersey	1,180	254	10
WMH	Precision Equipment Co., Cincinnati, Ohio	1,210	248	10
WQAS	Prince Walter Co., Lowell, Mass.	1,130	266	100
WHAQ	Semmes Motor Co., Washington, District of Columbia	1,240	242	10
WMAP	Utility Battery Service, Inc., Easton, Pennsylvania	1,220	246	50
WQAD	Whiteall Electric Co., Waterbury, Connecticut	1,240	242	50

Broadcasters Deleted During May

The following 20 stations were deleted from the lists of active broadcasting stations by the Department of Commerce during May:

Class A

KFGM—Abilene Daily Reporter, Abilene, Texas.
KFHC—University of Oklahoma, Norman, Okla.

Class C—360 Meters

KYI—Bakersfield Californian, Bakersfield, Cal.
KFGE—Buchanan Stevens Co., Mt. Vernon, Wash.
WWAJ—Columbus Radio Club, Columbus, Ohio.
WAAJ—Eastern Radio Institute, Boston, Mass.
WEAT—Fogarty, J. J., Tampa, Fla.
KFV—Foster-Bradbury Radio Store, Yakima, Wash.
KDZH—Fresno Evening Herald, Fresno, Calif.
WDAC—Illinois Watch Co., Springfield, Ill.
WFAU—Lewis, Edwin C., Inc., Boston, Mass.
KDN—Meyberg, Leo J., Co., San Francisco, Calif.
KYJ—Meyberg, Leo J., Co., Los Angeles, Calif.
WGAH—New Haven Electric Co., New Haven, Conn.
WHAR—Paramount Radio & Electric Co., Atlantic City, N. J.
WPAW—Radio Installation Co., Wilmington, Del.
KQY—Stubbs Electric Co., Portland, Oregon.
KFAZ—Weatherill, C. H., Reedley, Calif.
WJZ—Westinghouse Elec. & Mfg. Co., Newark, N. J. (Transferred to "Broadcast Central," New York City.)
WPM—Williams, Thomas J., Washington, D. C.

U. S. S. "Wyoming" Equipped For Duplex Radio Communication

HIGHLY gratifying results have been secured with a new model high-power tube transmitter installed on the battleship "Wyoming," and used in regular traffic. "In fact," states a Naval report, "some results were unexpected, such as ability to receive on the same vessel during full power operation of this tube rating about 5 KW." Numerous broadcasting stations transmitting on 400 meters were tuned-in in the auxiliary radio room, while the big transmitter, installed in the main radio room, was supplying 36 amperes to the main antenna on a wave length of 507 meters. The receiving set in the auxiliary room was equipped with an amplifier consisting of three stages of radio-frequency and two stages of audio-frequency. "This condition allows duplex communication, which has actually been put in practice on the Wyoming and will be further developed on the 'Colorado' and 'West Virginia,'" the report states.

The arrangement of the radio rooms on these two battleships will differ from present naval practice. Receiving will be done in the main receiving room forward and transmission will be carried on aft from the main transmitting room.

In Naval Aviation Squadrons new tube sets are also replacing spark sets. Five new aerial spotting sets have passed satisfactory tests and are en route to the Air Squadrons of the Battle Fleet, where they will replace SE 1345 sets now in use. Spark sets will be used only at Pensacola for training Naval radio personnel.

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Swat the Birdies! How to Minimize Re-Radiation

By Anderson James

THE rapid increase of "birdies" that swarm the ether is becoming a menace to successful radio reception. You can hear their chirps and tweets from every housetop. They light on your antenna and proceed to gargle their throats in the very midst of an operatic selection. They caw and groan and growl and squawk and sputter. And there is no way of scaring them off their perch. At such times there is a strong temptation to the average listener to desert the legitimate vocabulary and indulge in bootleg words. A remedy for the nuisance has been suggested by momentarily converting your receiving set into a transmitter and directing these words to the offender-in-chief. But chances are that he would be out of tune and would miss the message entirely, and the only effect would be to increase the suffering of the innocent bystander. Before you proceed to exact satisfaction be sure that you are not one of the offending birdie breeders. Remember that your neighbor's antenna is not a scarecrow, but it will attract the birdies you let loose as rapidly as your own. They will perch upon it and squirt their unmelodious gamuts into the listener's ears until he tears the phones off his head and condemns the whole radio game.

Let us declare an open season on the birdies. Swat them unmercifully. A little co-operation among the neighborhood birdie victims, and some radio detective work on their part, will readily locate the persistent birdie breeder. He should then be warned that his set is disturbing the neighborhood and, if he persists, his name should be posted or published for maintaining a public nuisance.

There is only one way in which this trouble may be completely eliminated and that is to prevent the receiving set from oscillating. But it is practically impossible to prevent a regenerative circuit from oscillating while tuning in if it is to work anywhere near its maximum efficiency; and the general use of non-regenerative sets can hardly be expected. It therefore remains to minimize re-radiation as much as possible. There are many ways of doing this.

One of the simplest is to detune the antenna circuit by three or more kilocycles from the frequency of the signal desired and depend on the selectivity of the secondary tuned circuit for signal strength. Since the antenna is not tuned to the incoming signals, local oscillations of about the same frequency cannot take place in it with any great intensity, and when they do take place the beat frequency will be too high to cause much interference.

Another method is to reduce the coupling between the primary and the secondary and between the primary and the tickler. There is no advantage in increasing the coupling beyond a certain point except where broadness of tuning is the object. In Fig. 1 is shown a curve representing the amount of energy transferred from the primary to the secondary when both are tuned to the same frequency. It is noticed that the current in the secondary at first increases very rapidly with an increase in the coupling but finally reaches a maximum point. Beyond this the current actually decreases and it is of no advantage to increase the coupling any further. The tickler coil should be so placed with respect to the antenna that the coupling is minimum and yet retain the desired coupling between the grid and plate circuits. The tickler may be wound on the same form as the secondary and the amount of regeneration varied by means of a series condenser, a variable resistance, or an inductive coupling elsewhere in the circuit. Then the coupling between the antenna and the secondary may be reduced without increasing the amount of re-radiation, as the coupling between the tickler and the antenna is also reduced. Either the primary or the secondary may be on the stator, but it will simplify wiring to put the antenna on the rotor and vary its inductance by means of a loading coil.

Re-radiation may be reduced by introducing the feedback energy by means of a coil in series with the secondary tuned circuit as is exemplified in Fig. 2, and placing them so that their axes are at right angles. This method may also be used in a single circuit tuner, whereas the preceding two were only applicable to double circuits. However, the single circuit is usually the chief offender in producing "birdies" and should be avoided wherever possible. Advantage may be taken,

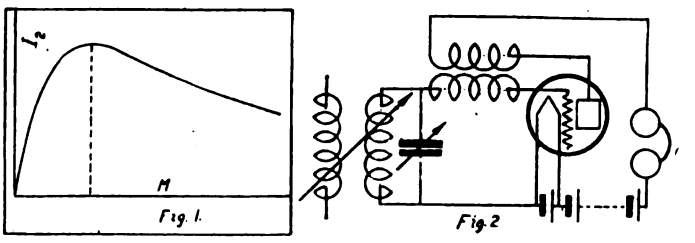

Diagram showing one method of decreasing re-radiation in a set.

however, of the greater range of the single circuit by using it as a non-regenerative amplifier followed by a regenerative detector or radio-frequency amplifier. This two tube circuit may be neutrodyned for better results.

The best non-regenerative circuit is undoubtedly a neutrodyne with tuned coupling between stages. If the neutrodyning has been properly done there is no back coupling from one stage to the preceding, and consequently there is no tendency to oscillate even when the successive stages are in exact resonance with the incoming signal and with each other. Therefore a regenerative detector may be used in connection with such circuit without danger of transferring sufficient energy to the antenna to cause appreciable interference with neighboring receivers. When, for economic and other reasons, it is not desired to use a multi-tube set, the best circuit is one of the simpler reflexes.

The chief source of birdies is the single circuit tuner in the hands of a DX-er with his mind in other states and his regard for the innocent bystander replaced by vanity. He sets his receiver into vigorous oscillation and then picks up the distant stations by the zero beat method. He squirts around the carrier from the remote station until he succeeds in identifying its call letters and off he goes to another carrier and repeats the performance. This he keeps up until Honolulu signs off for the night, and the result of his catch is a jumble of capital letters which he proudly labels "My Result of a Half Hour DX-ing with the New Squirt and Squawk Receiver."

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No Need for Clicks, Roars, Shrieks and the Awful Scream of Interference

By Arthur S. Gordon

WOW! Listen to her squeal! No concert tonight with QRM full blast next door! Can't seem to find a quiet wave length anywhere. Wonder what makes all that racket? Doesn't sound like any one kind of hubbub, but like the 57 varieties of din one on top of the other. It's getting worse and worse!"

Such is the plaint of the radio amateur whose receiver is catching and amplifying every sound in the universe excepting the ones it should.

What is there to do? Lots of things. Noises in a receiving set are there because of some fault in the adjustment of one or more of the various instruments. The discord can be cleared out easily and intelligently by an amateur who knows the separate causes, and it is the purpose of this article to describe those causes and to offer simple remedies which will reduce their disturbances to a minimum.

There are two general classifications of noises in radio receivers, outside and inside. Outside annoyances are those over which the amateur has no immediate control, such as the re-radiation of a neighboring set, atmospheric, and interference between two nearby broadcasting stations. These noises may be described as hoots, screams, crackles, roars, and discords. Inside noises, on the other hand, are those which originate within the cabinet of the radio receiver. They can be eliminated, provided, of course, that the set is properly designed and wired and the vacuum tube or tubes are not defective. It very often happens that a tube will be imperfectly made and thus have peculiar jangles all its own. Inside noises range anywhere from a series of widely separated clicks to high, shrill notes, with howls, hisses, rasps and wheezes thrown in for variety. When the outside and inside combinations get together, they produce the intensified and irritating effect known as "hash."

The tumult of sounds peculiar to a single tube set are increased in volume but scarcely in variety by one or two stages of amplification, with the possible addition of an amplifier howl. Taking up the inside noises one by one, the most disturbing and yet the easiest annoyance of which to rid oneself is the "howl" a receiver sets up whenever the operator moves his hands to or from the tuning dials. This effect is known as "body capacity." It is sometimes so great as to prevent a receiver from working. Of it one radio enthusiast writes:

"Body capacity was so bad in my set that at times I had to stand in a certain position and in no other. If I moved a fraction of an inch in any direction the set would howl and I would not be far from howling myself. The cord was very sensitive and if I moved my hands toward it or touched the headset the signals were gone. Touching the dials with anything less than a ten-foot pole was out of the question."

This statement may sound like the first few lines of a patent medicine advertisement, but it is true, every word of it. The radio amateur who wrote it found that his trouble was in placing the headphones on the negative side of the "B" battery. He changed over, placed the phones between the "B" battery and the tickler coil, and has ever since lived in peace with himself and his neighbors.

There are other ways of getting rid of troublesome body capacity. Having the aerial lead go to the rotor of the variable condenser, for example, instead of to the stator, takes away some of the annoyance, but by far the best way is to shield the entire back of the panel, making sure that the metal or foil used for shielding is not only grounded but that it does not touch any of the instruments.

Discontented grid-leak complaints come next. The grid-leak—properly adjusted—is a blessing, but improperly adjusted, it is just the opposite. It may be either over or under adjusted. The noises it is father to range from a slow steady click heard all around the tuning dials to a high, shrill scream heard only at certain points. These noises, to say the least, interfere with the operation of the set. They are caused by the "make and break" of the tube oscillations as they are alternately passed and choked by an *insufficient* value of grid-leak.

The slow clicks mean that the leak resistance is too high. It should be cut down, therefore, until the high, shrill note is reached. At this point, the proper resistance has almost been reached. Cut it down just a trifle more, and the shrill note will enter the inaudible stage. Be careful here. If the resistance goes the least shade below the proper value, no noises will be heard, it is true, but no signals will either, although there will be plenty of spark signals and carrier wave whistles to egg you on.

You probably will notice, when you have the grid-leak adjusted very close to its ideal value, that a certain position of your tickler coil will produce a low harsh hum, something like that of a hoarse fog-horn. Stop here. This is about the practical limit of amateur adjustment. If you want to search for signals in that area, lower the filament current, step down the "B" battery, and this hum will disappear.

For convenience, it is best to have a variable grid-leak condenser, which can almost in a moment be adjusted to the "silent value" demanded by the particular requirements of your own tube.

Harsh, sandy or grinding noises in the phones, resembling mild atmospheric, are due either to tight coupling or defective batteries, A or B singly, or both at once. A hiss or roar is due to excessive regeneration. Amateurs continue to discover that far better results are obtained with a minimum of filament current than with a maximum. A loud metallic vibration, noticed particularly with the WD-11 tube when the table or the cabinet is tapped, is merely a physical demonstration. It is due to the too rigid mounting of the tube socket. Place it on soft rubber or felt and this objectionable noise will disappear.

A pretty medley of discord comes from a receiver that is not properly wired. A loud and persistent hum that refuses to be tuned out indicates either a wrong or broken connection. If you hear this hum the very first time you listen in, ten chances to one you have made a mistake in wiring. If you hear it after the set has performed satisfactorily for some time, look for a broken connection.

Sometimes when you are enjoying a 360-meter concert to the utmost, in butts a 200-meter amateur crazy-bent for election. Due to his nearness, he slops over his assigned wave length and ruins your concert. He can be shunted out by a rejector circuit such as often has been described in RADIO WORLD. This is simply

(*Continued on next page*)

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Radio and the Woman

By Crystal D. Tector

MORE family trouble laid at the door of radio—and probably inefficient domestic management. The daily papers record that the lure of radio crop reports, lectures, popular songs and bedtime stories is given as the cause for marital disaster in a petition by a Queensboro woman. She charges that the attractions of the wireless waves kept her husband up "far into the night, listening to the music and messages." And when he finally came to bed he kept her awake the rest of the night arguing about new sets and wiring problems, she asserts. Again I ask—why not two sets of head phones and joint conjugal enjoyment.

* * *

Friend Husband and I went to the movies the other evening. As a part of the program they had a very instructive film which showed, in picture form, the way in which a radio wave is generated, modulated, propagated, received, rectified and amplified. It was a very interesting film and it was explained in a thorough and easily understandable manner, by means of cartoons with moving lines showing each change in current or wave. After seeing it, F. H. remarked, "Holy Moses, who in the world would think that that can all happen within a pace of time less than a second!"

* * *

I think that this particular idea of visualizing popular scientific facts is excellent and should be exploited more. Just think of the many ways in which it could be done. Automobiles and electricity, and oh, so many other things that are a continual mystery to the lay mind could be explained. I once heard a professor lecture and he told the class that the best way to impress a thing indelibly was to show it to a person and let him photograph it on his mind. Well, there were a lot of wise people that went out of that little movie that evening with at least a faint idea of what happens when they are listening to a radio concert. I know I went home impressed with the immensity of it all and the complete mastery of the theory that the engineers at the research laboratories must have.

* * *

F. H. came home the other night loaded down with some boxes and bundles and funny looking parcels. He took them into the garage and locked the door. I, of course, was all questions and curiosity but it availed me not. He was as informative as a clam with a bad case of lockjaw. After supper he sneaked off and locked himself in the garage and wouldn't even let me take the car out. I had no intentions of going out, but merely wanted to satisfy my curiosity. He stayed out in the smelly old place until about 11 o'clock and then, locking the door very carefully, put the key in his pocket and went to bed. The next morning when he had gone to business I went inside the garage and found—whatever do you think? A radio set *in our car*. Well, I had been teasing him to take our vacation traveling around the country this summer and so, thoughtful boy, he had started to get everything ready, even to buying a loop set for the car. Won't we have fun?

(C. International Newsreel Photo.)

Miss Phyllis Blackman, of Ridgewood, Long Island, who claims to have built her own receiver and made many long distance records with it. The receiver is a three circuit tuner of the conventional type.

(*Concluded from preceding page*)

a single circuit tuner consisting of a coil of wire and a variable condenser, which is run from the aerial to the ground apart from the bulk of the receiver. When the rejector circuit is tuned to 200 meters, all signals coming in on that wave length will go immediately to the ground.

The gurgling, rough, distorted music you sometimes hear is largely due to re-radiation from nearby sets. For this there are several cures. These do not include a law, as in England, against receivers which oscillate excessively, but they do contain a caution directed to those operators, who, because of inexperience or thoughtlessness, allow their two or three tube sets to transmit annoying howls while they are hunting for a station. This method of tuning is known as the "beat-note method," and has been found to still persist in its disturbing qualities at distances up to 25 miles.

One cure for re-radiation (others are the use of non-radiating tubes or circuits) is in a new conception of tuning. There is no need to have your tubes oscillating while hunting for a station. While you are doing so, annoying whistles running up and down the scale are crossing and re-crossing the concert program of your nearest neighbors. Why not adopt and urge others to adopt a milder method of tuning in?

Adjust the filament control to a point which by practice you know to be satisfactory. That is to say, adjust it to that low point it invariably falls to in the end. Now move the tuning dials slowly. Instead of a shrill carrier whistle, or a sharp squeak, you will be surprised to hear music or a voice coming in without any of the preliminary warnings or noises so commonly associated with tuning in a station. If your filament current is slightly insufficient, you will hear a hollow or breathing sound, with a slight increase in the regenerative stir in your headphones. A slight turn of the rheostat will remedy matters in a case of this kind. You will become accustomed to this method of tuning and not only will you prefer it to the more violent beat-note method, but you will be conferring a favor upon your neighbors—to say nothing of the wear and tear you will save on your tubes.

By a complete understanding of what makes the noises in our set, we are enabled to increase its efficiency. The more sensitive a receiver is, the more it seems to be affected by the noise producing defects. Many amateurs decrease the filament current, or step down the "B" battery to cut out the howling and other annoyances. This is obviously not the thing to do. It neither remedies the causes of howling nor does it get the most out of a tube which is more than anxious, under proper control, to do its best—and do it silently if you operate it properly.

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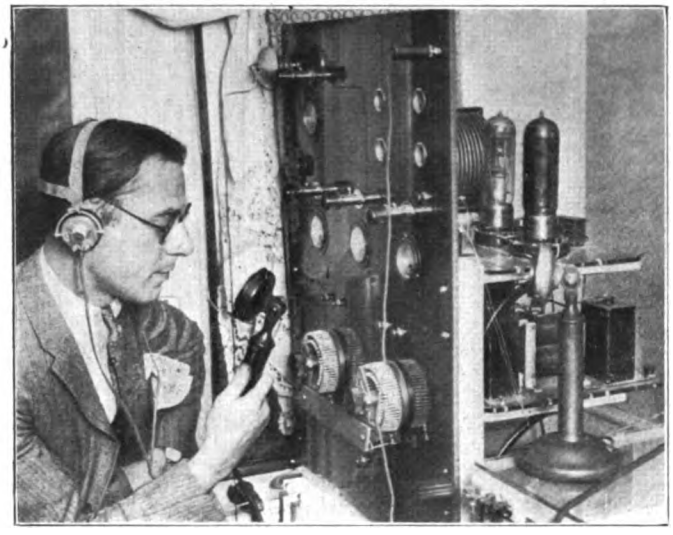
New York Amateur Owns $5,000 Station

By Earl Chatham

AN amateur station that lays claim and rightly so to being one of the finest equipped and most beautiful stations in the country, is Radio Station 2ABT, owned and operated by George Freisinger, a prominent New York amateur. From the standpoint of usefulness and workmanship, the station is the acme of perfection. From the standpoint of looks it is a beauty.

Referring to the illustration on the front cover, the extremely neat and efficient layout of the station can be seen. On the extreme left hand side of the table is the combined transmitter and receiving panel. On this is mounted the combined transmitter and the honeycomb coil receiver. The transmitter, which is a specially built machine, uses the Heising-Colpitts system of modulation and transmission. With this transmitter Cuban stations have been worked consistently. The transmitter is a 20 watt set, using two five watt oscillators, two five watt modulators, and one five watt speech amplifier. The amplifying transformers of the receiving system are also incorporated in the speech amplifying circuits, making three tubes in all as speech amplifiers. This is done through a special system of jacks which cut in on the receiving circuit, shortening the inductances and other apparatus and connecting up the amplifying circuits into the transmitting circuit. Either phone or CW can be used with this set and a distance of 1,800 miles has been consistantly covered.



(C. Kadel & Herbert)

100 Watt C. W. Transmitter at Station 2ABT. A complete view of the station is shown on the front cover of this issue.

Next to this cabinet, and in the smaller panel, is the Reinartz tuner with two steps of audio-frequency amplification. With either of these two sets the power amplifier can be used and horns are located through the entire house. By a system of jacks and plugs any one or a number of them can be plugged in at will.

For straight C. W. a 100 watt set is used, as shown in the smaller illustration on this page. Although constructed primarily for CW or buzzer modulation, it can be used with fair success as a phone set. The two 50 watt tubes are shown in the illustration, directly next to the tuning inductance.

The current for the operation of both of the sets is derived from a 1,000 volt generator of the airplane type. They are specially mounted and located in a noise proof cabinet in the main table of the set.

Every one of the units of this station were put to the most rigorous test before being combined in the final set which is shown, and then a special table was made to incorporate the different units.

Radiograms

Chas. R. C. Ham informs RADIO WORLD that a radio club has just been formed in Hong Kong, China.

* * *

Frank H. Shevit, income tax expert, will broadcast a series of short talks on the federal income tax from Station WJZ every Friday evening. Questions submitted by mail will be answered by radio.

* * *

British North Borneo has hundreds of thousands of acres suitable for the growing of rubber, according to Sir William Rycroft, Governor of that territory, who is visiting Manila, P. I. He said the Japanese have large concessions at Tawao, on the east coast of Borneo, where they have 20,000 acres planted to rubber.

* * *

Electric railways in the United States will spend the enormous sum of $240,000,000 for new equipment and plant facilities during 1923, according to a survey of expansion programs just announced by the Illinois Commission on Public Utilities. These proposed expeditures are about 60 per cent greater than those in 1922.

(*Concluded from page 7*)

now being manufactured in the Schenectady works of the General Electric Company and tested at WGY.

The Pacific coast station will be operated at 1,000 watts, but the equipment will be designed in excess of that power for purposes of conducting tests. In operating high-powered equipment below normal rating in broadcasting, tubes and rectifiers are not subject to occasional overloads, and, as a result, superior quality and greater reliability of transmission are obtained.

Six motor-generator sets will be placed in the power house and these will supply filament and plate current for the oscillator, modulator and kenetron rectifier tubes.

Every part of the equipment in the power house and in the control room will be in duplicate, assuring uninterrupted service. If one outfit or part of an outfit breaks down during the operation period another part will be ready to be brought into the circuit.

There will be six tubes in the kenetron rectifier assembly, one metal plate oscillator tube and one metal plate modulator tube. The control room in the studio building will have three stages of speech amplification made up of two 5-watt tubes and four 50-watt tubes. A fourth stage of speech amplification will be installed in the power house.

By means of what is known as "remote control" the facilities of a radio broadcasting station may now be brought to banquet hall, theatre or church and the audience, heretofore limited to the seating capacity of hall or church, is multiplied many times. The church is connected to the transmitting equipment by telephone lines and control of broadcast material is maintained in the church by operators.

The Pacific Coast station of the General Electric Company will utilize "remote control" to broadcast church services and musical entertainments from San Francisco and Oakland. The Pacific Telegraph & Telephone Company has offered to provide land wire connection.

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Elementary Instruction for the New Army of Radio Beginners

Constantly Used Terms Explained in Plain Language for the New Radio Enthusiast

By Lynn Brooks

RE-RADIATION: This term, when applied to a receiver, means the circuit's ability to radiate a wave of its own origin. In regenerative or oscillating circuits, this wave changes in length with every change in the receiver, and it is due to this ability of a receiver that causes interference and "birdies" in other receivers. By correct design and placing of capacity and inductance this bug-bear of regenerative receivers can be eliminated, or a circuit may be attached or placed in relation to the tuning element of the receiver which will absorb the radiated wave and render the receiver incapable of putting the energy into the antenna.

* * *

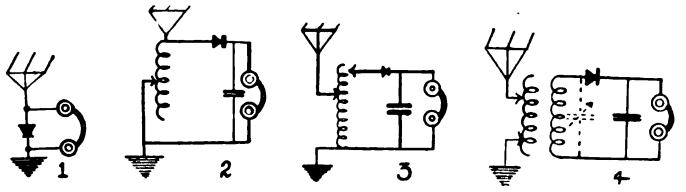
INSULATION: In all circuits carrying electricity some material must be used to prevent the electricity flowing in the line from leaking away, or finding a shorter path to its eventual destination by using another conductor. In order to accomplish this, insulation is used, which is any material that will not conduct electricity. The most common form of insulating material is rubber, both hard and soft. In its hard state it is used as panel, tubes and rod, and also as dials and different parts such as stators, rotors, etc. In its soft state it is used as tubing to cover wires. Bakelite and various other synthetic compositions are also used for the same purpose. Wood when dry is an insulator, even though a poor one, and while sometimes used for panels, it is not to be recommended.

* * *

COUPLING: In a receiving circuit there are two methods of coupling commonly used to transfer the signals from the antenna circuit to the detector circuit. The simplest and easiest method is to use conductive coupling. In conductive coupling the antenna and detector circuits are joined by means of wire, the tuning being accomplished by varying the inductance and capacity in the circuit, and therefore changing the frequency to which the circuit will respond. This method of coupling is used in all the single circuit sets. In these circuits the advantage is simplicity in both construction and tuning, as generally the circuit is tuned by either one or two controls, either of which contrals capacity, or inductance. In the second method, called inductive coupling, the antenna and detector or rectifying circuits are separate, the link between the two being the closeness or looseness of coupling used. In close coupling the secondary inductance is placed in such a manner that the windings are close together, and the electro-magnetic coupling is at its highest point. When this is the case, the signals in the detector circuit will be strong but the tuning will be broad, because of the fact that the electrostatic coupling is close. As the tuning is loosened, the coupling between the two circuits decreases and greater selectivity is obtainable. The advantage of using this type of tuning in a circuit is obvious, as the secondary circuit can be tuned independent of the primary circuit, and if there is more than one station transmitting at the same time, the one desired can be obtained with the least amount of interference from the second.

* * *

CIRCUIT: A combination of instruments connected in such a manner that they will either transmit an electro-magnetic wave or be capable of receiving or making audible to human ears the electro-magnetic waves of a transmitter. Receiving circuits are divided into various classes, depending upon the complexity of each one. The simplest receiving circuit possible consists of simply an antenna, detector, phones and ground as shown in Fig. 1. This is an untuned circuit and of the simplest form. No tuning can be done with this circuit and reception will only be possible on waves of the same length and period as that of its antenna. The simplest tuned circuit is that shown in Fig. 2. It consists of a single slide tuner, detector, fixed condenser, phones, antenna and ground. This is more selective than the preceding circuit. It can be tuned by moving the slider up or down the inductance and incorporating more or less wire in the circuit and therefore changing the wave length, or frequency, to which the circuit will respond. Fig 3 shows a two



Figs. 1-4. Diagrams illustrating simple crystal circuits, from the untuned to the inductively coupled set.

slide tuner circuit, incorporating the same apparatus as the preceding, with the exception of utilizing a two slide tuner instead of the single slide tuner. With this it is possible to tune the antenna circuit and at the same time tune the detector circuit. This circuit can be made even more selective by the addition of a variable condenser as shown in the dotted line. In direct line with these are the inductively coupled circuits. The simplest circuit of this type consists of a variocoupler, or loose coupler, crystal detector, phones, phone condenser, antenna and ground. There is no direct connection between circuit A and circuit B. Circuit A is the antenna tuning circuit and consists of the antenna, lead in, primary and ground. The secondary circuit is the secondary of the coupler, the detector, phones and condenser.

These circuits can be made more selective by the addition of condensers as shown in dotted lines in the drawings. In the coupled circuit the action is as follows: The antenna intercepts the transmitted wave and by means of the lead-in carries it to the primary of the circuit. This primary is tuned to the desired wave length and the current flowing in the first circuit induces a like current in the second circuit. This current being alternating (flowing first one way and then reversing) would not be heard in the phones, as the phones do not respond to the rapid alternations. The detector which is a uni-lateral conductor (allowing current to flow in one direction only) rectifies it and the current flows through the phones as a direct current, making the signals audible. Other circuits will be shown and explained in future issues of RADIO WORLD.

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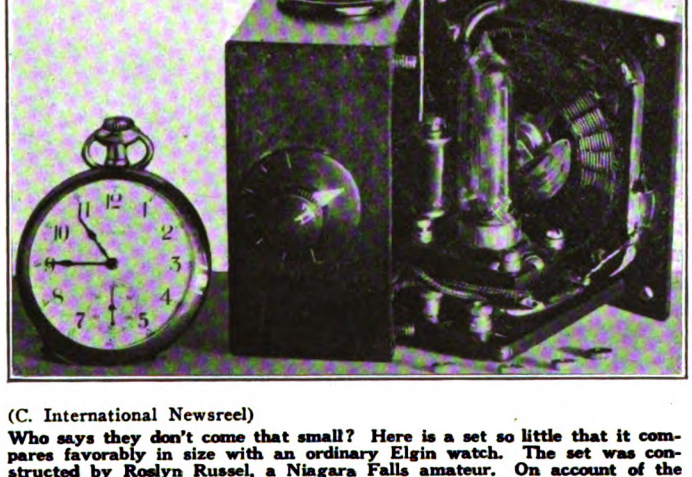
The Camera Men K

Here Are the Lat

Captions by Robe

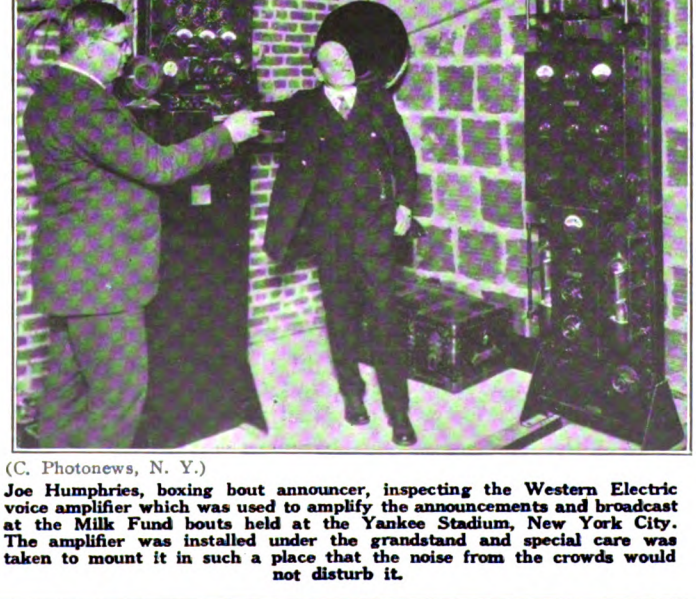
(C. Photograms)

If you intend to travel, particularly between Cincinnati and Louisville, you may be assured that your trip will not be monotonous, no matter how travel hardened a traveling salesman you are. They have installed in the day coach, for the convenience of the passengers, a special receiver using radio-frequency, detector and power amplification, in conjunction with the Western Electric loud speaker, making it possible to hear broadcast programs above the noise of the train.



(C. International Newsreel)

Who says they don't come that small? Here is a set so little that it compares favorably in size with an ordinary Elgin watch. The set was constructed by Roslyn Russel, a Niagara Falls amateur. On account of the small space necessary a home-made spider web inductance was used. The tickler, being stationary, was wound inside of it and a special variable condenser was used. It has a range of 200 to 600 meters, and has copied stations over a radius of more than 900 miles.



(C. Photonews, N. Y.)

Joe Humphries, boxing bout announcer, inspecting the Western Electric voice amplifier which was used to amplify the announcements and broadcast at the Milk Fund bouts held at the Yankee Stadium, New York City. The amplifier was installed under the grandstand and special care was taken to mount it in such a place that the noise from the crowds would not disturb it.

Your Wave Lengths A

(C. Photonews, N. Y.)

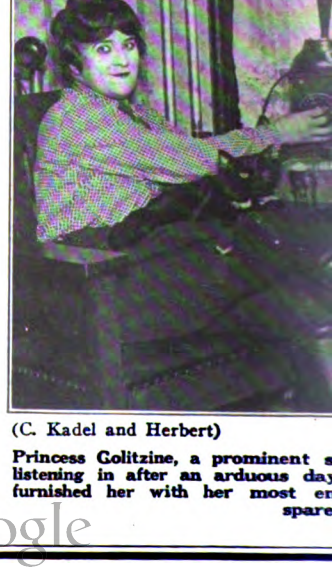
Radio frequency meter used in the office of the Chief Radio Inspector, Second District, for measuring the impressed frequency of the transmitter of a distant station.

FEW people realize the constant activity on the part of the radio division of the United States Department of Commerce to keep an accurate check on the wave lengths of the various stations in the several districts. Every day in the year and every hour of the day there is some one in an official capacity checking up on the wave lengths of the various stations transmitting.

This is especially important since the allocation of the new wave lengths for the broadcasting stations. Down at the Custom House in New York City sits a man with a pair of receivers on his head and a high power receiver in front of him. In conjunction with this receiver there is an up-to-date heterodyne wave meter. This meter is of the most

(C. Photonews, N. Y.)

The apparatus in the Y. M. C. A. Radio School, New York City, and one of the students learning how to adjust it. It is a regulation Navy spark 5-KW type.



(C. Kadel and Herbert)

Princess Golitzine, a prominent s listening in after an arduous day furnished her with her most en spare

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Keep At It Nobly—
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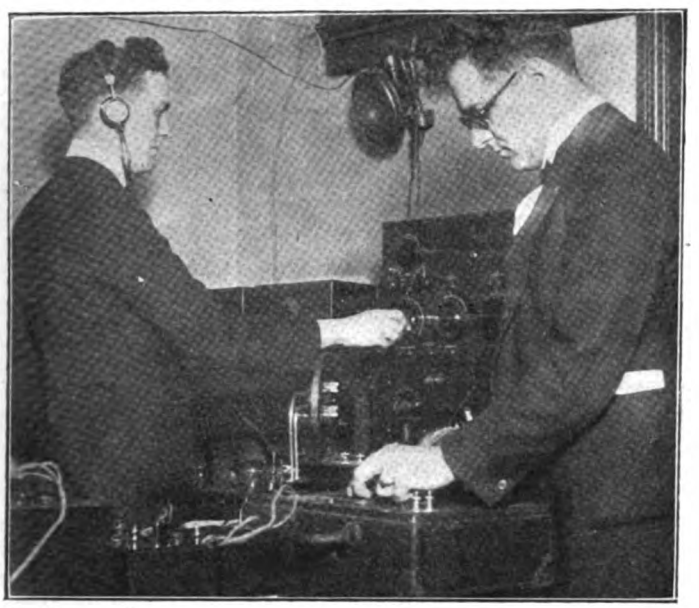


(C. Photonews)
Arthur Batcheller, supervisor of radio at the U. S. Custom House, New York City, calibrating the wave meter by the zero beat method from the standard wave sent out by the Bureau of Standards, Washington, D. C.

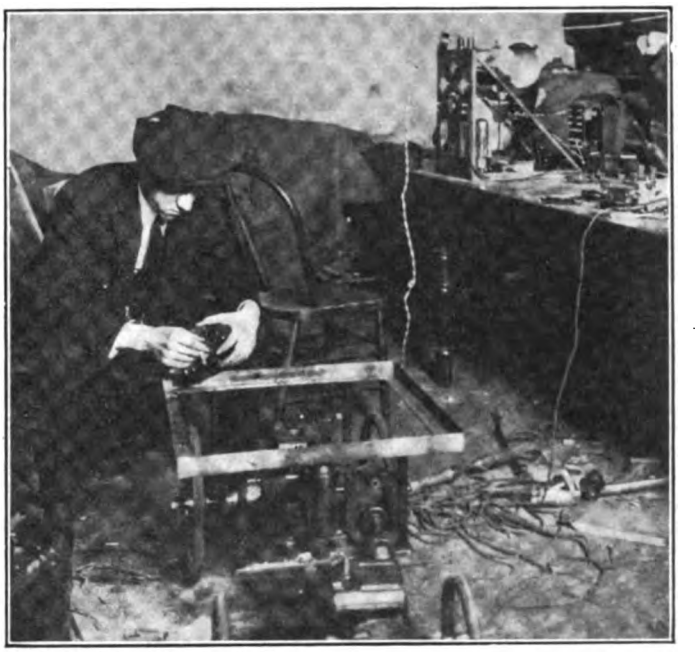
accurate type and can record to a fraction just what the frequency of any wave is. As the wave length depends upon the frequency of the emanated wave, it is easy immediately to check up any station.

Besides the men at the Custom House each one of the inspector's staff has a radio set at his home, and they have certain nights when they must be "on duty" in their own homes, checking up the waves and telling any station that is off just what the trouble is.

It is only by the constant activity of this group of men that the commercial and amateur transmission can be kept up to the high standard of accuracy that now prevails.

ortswoman and an ardent radio fan, of riding. She says that radio has oyable form of pastime during her minutes.

Neatness is one of the factors in the construction of a receiver which promotes highest efficiency. You fans who like to build your sets take a look at the construction of Harold Slater's and get some ideas for your next one.



(C. International Newsreel Photo)
Mark Swanson, a Minneapolis inventor, perfecting his radio controlled automobile. The machine, which is a model of one of the popular types of cars, is entirely controlled in its movements by different length waves.

(C. Photonews, N. Y.)
Officials of the Radio Corporation of America at the recent dedication ceremonies of "Broadcast Central," Aeolian Hall, New York City. Left to right, they are Owen D. Young, Chairman of the Board of the R. C. A.; General H. G. Harboard, President of the Corporation; and Dr. Alfred N. Goldsmith, Director of Research of the Corporation.

(C. Kadel and Herbert)
A radio set has been installed in Mayor Hylan's reception room at City Hall, New York. It will be a welcome diversion for callers who daily twiddle their fingers and kick their heels against the expensive furniture. The set, which was presented by the Radio Corporation, is the Radiola Grand, one of the popular sets made by that Company.

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Latest Offical List of Broadcasting Stations in the United States

FOLLOWING is the first installment of an official list of commercial broadcasting stations in the United States as issued by the Department of Commerce. The list will be continued in next week's RADIO WORLD.

As new allocations of wave lengths to stations now operating on 360 meters are made by the Department of Commerce, the changes will be published by RADIO WORLD.

Readers who save these installments will have a complete list of broadcasters with their station calls, location, frequency, wave lengths and power.

Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
KFAV	Abbott Kinney Co., Venice, Cal....	833	363	5
WEAK	Abercrombie, Julius B., St. Joseph, Missouri	833	360	100
KFDA	Adler's Music Store, Baker, Ore..	833	360	5
WTAW	Agricultural & Mechanical College of Texas, College Station, Tex.	833	360	100
WMAV	Alabama Polytechnic Institute, Auburn, Ala	1,200	250	250
WSY	Alabama Power Co., Birmingham, Alabama	833	360	500
WCAR	Alamo Radio Elect. Co., San Antonio, Texas	833	360	150
WGAW	Albright, Ernest C., Altoona, Pa..	833	360	20
KZM	Allen, Preston D., Oakland, Cal....	833	360	100
KGO	Altadena Radio Lab., Altadena, Cal.	833	360	50
WRAU	Amarillo Daily News, Amarillo, Texas	833	360	20
WJAB	American Radio Co., Lincoln, Neb.	833	360	250
WGI	American Radio & Research Corp., Medford Hillside, Mass.	833	360	500
KFEZ	American Society of Mechanical Engineers, St. Louis, Mo.	833	360	500
WEAF	American Telephone & Telegraph Co., New York, N. Y.	610	492	500
WIAU	American Trust & Savings Bank, Le Mars, Iowa	833	360	15
WPAA	Anderson & Webster Elect. Co., Wahoo, Nebraska	833	360	150
WQAJ	Ann Arbor Times News, Ann Arbor, Michigan	833	360	100
KFI	Anthony, Earl C., Inc., Los Angeles, California	640	469	500
WRAV	Antioch College, Yellow Springs, O.	833	360	200
WOAG	Apollo Theatre, Belvidere, Ill.	833	360	20
WQAK	Appel-Higley Elect. Co., Dubuque, Iowa	833	360	50
KQP	Apple City Radio Club, Hood River, Ore.	833	360	10
WFAT	Argus-Leader, Sioux Falls, S. D..	833	360	50
KFGL	Arlington Garage, Arlington, Ore..	1,280	234	5
WABG	Arnold Edwards Piano Co., Jacksonville, Fla	1,210	248	10
WMAD	Atchison County Mail, Rockport, Missouri	833	360	50
WGM	Atlanta Constitution, Atlanta, Ga...	700	429	500
WSB	Atlanta Journal Co., Atlanta, Ga..	700	429	500
WDAJ	Atlanta & West Point R. R. Co., College Park, Ga.	833	360	500
WPAM	Auerbach & Guettel, Topeka, Kan..	833	360	5
KFEX	Augsburg Seminary, Minneapolis, Minn.	1,150	261	100
KFER	Auto Electric Service Co., Ft. Dodge, Iowa	1,300	231	10
KDZF	Automobile Club of Southern California, Los Angeles, Calif.	1,080	278	500
WDAO	Automotive Electric Co., Dallas, Texas	833	360	50
WHAE	Automotive Electric Service Co., Sioux City, Iowa	833	360	20
KFBC	Azbill, W. K., San Diego, Calif....	833	360	20
WOAS	Bailey's Radio Shop, Middletown, Connecticut	833	360	50
WEAR	Baltimore American & News Pub. Co., Baltimore, Md.	833	360	50
WOR	Bamberger, L., & Co., Newark, N. J.	740	405	500
WPAY	Bangor Radio Laboratory, Bangor, Maine	833	360	20
WBBD	Barbey Battery Service, Reading, Pennsylvania	1,280	224	50
KFFZ	Al. G. Barnes Amusement Co., Dallas, Texas	1,330	226	20
WQAA	Beale, Horace A., Jr., Parkesburg, Pennsylvania	833	360	500
WAAL	Beamish Elect. Co., Minneapolis, Minnesota	833	360	100
WMAM	Beaumont Radio Equipment Co., Beaumont, Texas	833	360	100
KDZR	Bellingham Publishing Co., Bellingham, Wash.	1,150	261	50
KFIF	Benson Tech. Student Body, Portland, Ore.	833	360	200
WEB	Benwood Company, Inc., The, St. Louis, Mo.	833	360	500
KRE	Berkeley Gazette, Berkeley, Cal...	833	360	50
KJS	Bible Institute, Los Angeles, Cal...	833	360	750
WRAN	Black Hawk Electrical Co., Waterloo, Iowa	1,310	229	20
KFHB	P. L. Boardwell, Hood River, Ore.	1,070	280	10
WKAY	Brenan College, Gainesville, Ga....	833	360	20
WMAN	Broad Street Baptist Church, Columbus, Ohio	833	360	10
WQAH	Brock-Anderson Elect. Eng. Co., Lexington, Ky.	1,180	254	10
KNN	Bullock's, Los Angeles, Calif.....	833	360	100
KFDR	Bullock's Hardware & Sporting Goods, York, Neb.	833	360	10
KFEY	Bunker Hill & Sullivan Mining & Const. Co., Kellog, Idaho	833	360	10
WIAS	Burlington Hawk Eye-Home Elect. Co., Burlington, Iowa	833	360	150
WDZ	Bush, James L., Tuscola, Ill.	1,080	278	10
KFBB	Buttrey & Co., F. A., Havre, Mont.	833	360	50
WQAO	Calvary Baptist Church, New York	833	360	100
WJAQ	Capper Publications, Topeka, Kan.	833	360	50
KFDF	Casper Community Radio Corp., Casper, Wyo.	833	360	100
WQAW	Catholic University of America, Washington, D. C.	833	360	5
KFHF	Central Christian Church, Shreveport, La.	1,130	266	150
WDAD	Central Kansas Radio Supply, Lindsborg, Kansas.	833	360	10
WPE	Central Radio Co., Inc., Independence, Mo.	833	360	200
WLAS	Central Radio Supply Co., Hutchinson, Kan.	833	360	25
WNAQ	Charleston Radio Elect. Co., Charleston, S. C.	833	360	20
KFGP	Cheney Radio Co., Cheney, Kan....	1,310	229	10
WAAF	Chicago Daily Drovers Journal, Chicago, Ill.	1,050	286	200
WMAQ	Chicago Daily News, Chicago, Ill..	670	448	500
WJAZ	Chicago Radio Laboratory, Chicago	670	448	600
KFGD	Chickasha Radio & Elect. Co., Chickasha, Okla.	1,210	248	20
KFBS	Chronicle News, Gas & Electric Supply Co., Trinidad, Colorado	833	360	150
WIAQ	Chronicle Publishing Co., Marion Indiana	833	360	10
WDM	Church of the Covenant, Washington, D. C.	833	360	100
WIZ	Cino Radio Mfg. Co., The, Cincinnati, Ohio	833	360	200
KUS	City Dye Works & Laundry Co., Los Angeles, Cal.	833	360	100
WBU	City of Chicago, Chicago, Ill.	833	360	500
WRR	City of Dallas, Police & Fire Signal Dept., Dallas, Texas	833	360	20
KFAQ	City of San Jose, San Jose, Calif..	833	360	250
KFEB	City of Taft, Taft, Calif.	833	360	50
WCN	Clark University, Worcester, Mass.	833	360	600
WSAC	Clemson Agricultural College, Clemson College, S. C.	833	360	500

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Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
KUY	Coast Radio Co., El Monte, Calif.	833	360	50
WHAC	Cole Bros. Elect. Co., Waterloo, Ia.	833	360	50
WQAL	Cole County Tel. & Tel. Co., Mattoon, Ill.	833	360	25
WOAK	Collins' Hardware Co., Frankfort, Kentucky	833	360	20
KFCK	Colorado Springs Radio Co., Colorado Springs, Colorado	833	360	10
KFHA	Colorado State Normal School, Gunnison, Col.	833	360	50
WMC	Commercial Publishing Co., Memphis, Tenn	600	500	500
WAAH	Commonwealth Electric Co., Inc., St. Paul, Minn	833	360	500
WCAZ	Compton, Robert E., & Carthage College, Carthage, Ill.	833	360	100
WPAU	Concordia College, Moorhead, Minn	833	360	20
WIL	Continental Electric Supply Co., Washington, D. C.	833	360	10
WIAH	Continental Radio Mfg. Co., Newton, Iowa	833	360	10
WEAI	Cornell University, Ithaca, N. Y.	1,050	286	500
WEY	Cosradio Company, The, Wichita, Kansas	833	360	100
WHAS	Courier Journal & Louisville Times, Louisville, Ky.	750	400	500
WHK	Cox, Warren R., Cleveland, Ohio	833	360	100
KFCQ	Crary Hardware Co., Boone, Iowa	1,330	226	20
WLW	Crosley Manufacturing Co., Cincinnati, Ohio	833	360	500 & 200
KFDO	Cutting, H. S., Bozeman, Mont.	1,210	248	10
WLAG	Cutting & Washington Radio Corp., Minneapolis, Minn.	720	417	500
KDZG	Cyrus Pierce & Co., San Francisco, Cal.	833	360	250
WWB	Daily News Printing Co., The, Canton, Ohio	833	360	20
WCAG	Daily States Pub. Co., New Orleans, La.	833	360	100
WNAX	Dakota Radio Apparatus Co., Yankton, S. D.	1,230	244	100
WCAK	Daniel, Alfred P., Houston, Texas	833	360	50
WFAA	Dallas News & Dallas Journal, Dallas, Texas	630	476	500
WEAX	Daly, T. J. M. (Argenta), Little Rock, Ark.	833	360	20
WEAU	Davidson Bros. Co., Sioux City, Ia.	833	360	20
WBAH	Dayton Co., The, Minneapolis, Minn.	833	360	500
WIAF	De Cortin, Gustav A., New Orleans, La.	833	360	100
WJX	De Forest Radio Tel. & Tel. Co., New York City	833	360	500
KFKH	Denver Park Amusement Co., Lakeside, Colo.	1,330	226	10
KZN	Desert News, The, Salt Lake City, Utah	833	360	500
WCX	Detroit Free Press, Detroit, Mich.	580	517	500
KOP	Detroit Police Dept., Detroit, Mich.	1,050	286	500
WCAV	Dice Electric Co., J. C., Little Rock, Ark.	833	360	100
KFHI	Dixon, Charles V., Wichita, Kan.	1,340	224	20
KFZ	Doerr-Mitchell Elect. Co., Spokane, Wash.	1,060	283	5
WPAC	Donaldson Radio Co., Okmulgee, Okla.	833	360	200
KFAT	Donohue, Dr. S. T., Eugene, Ore.	833	360	100
WPAJ	Doolittle Radio Corp., New Haven, Conn.	833	360	30
WRK	Doron Brothers Electric Co., Hamilton, Ohio	833	360	100
KQV	Doubleday-Hill Electric Co., Pittsburgh, Pa.	833	360	250
WMU	Doubleday-Hill Electric Co., Washington, D. C.	1,150	261	100
WMAJ	Drovers Telegram Co., Kansas City, Mo.	1,090	275	250
WCAU	Durham & Co., Philadelphia, Pa.	1,050	286	100
KFFE	Eastern Oregon Radio Co., Pendleton, Ore.	833	360	100
WRAK	Economy Light Co., Escanaba, Mich.	833	360	200
KNX	Electric Lighting Supply Co., Los Angeles, Cal.	833	360	250
WQAM	Electrical Equipment Co., Miami, Fla.	833	360	250
KFCH	Electric Service Station, Billings, Mont.	833	360	10
KYQ	Electric Shop, Honolulu, T. H.	833	360	40
KFAN	Electric Shop, Moscow, Idaho	833	360	50
WLAV	Electric Shop, Inc., Pensacola, Fla.	833	360	100
WPI	Electric Supply Co., Clearfield, Pa.	833	360	20
WFAH	Electric Supply Co., Port Arthur, Texas	833	360	10
KDEI	Electric Supply Co., Wenatchee, Wash.	833	360	50
KFGZ	Emmanuel Missionary College, Berrien Springs, Mich.	1,120	268	10
KSL	Emporium, The, San Francisco, Cal.	833	360	50
WCAH	Entrekin Electric Co., Columbus, Ohio	1,050	286	100
WTAS	Erbstein, Charles E., Elgin, Ill.	1,090	275	500
WRAV	Erner & Hopkins Co., The Columbus, Ohio	833	360	250
WOAJ	Ervins Electrical Co., Parsons, Kan.	833	360	15
WWJ	Evening News Ass'n, Detroit News, Detroit, Mich.	580	517	500
KUO	Examiner Printing Co., The, San Francisco, Cal.	833	360	500
WEAA	Fallain & Lathrop, Flint, Mich.	833	360	100
KFHJ	Fallen Co., Santa Barbara, Cal.	833	360	100
WRP	Federal Institute of Radio Telegraphy, Camden, N. J.	833	360	100
WDAY	Fargo Radio Service Co., Fargo, N. D.	1,230	244	50
WGR	Federal Tel. & Tel. Co., Buffalo, N. Y.	833	360	300
WCE	Findley Electric Co., Inc., Minneapolis, Minn.	833	360	250
KFFP	First Baptist Church, Moberly, Mo.	1,090	275	50
KFDX	First Baptist Church, Shreveport, La.	833	360	200
WDAX	First National Bank, Centerville, Ia.	833	360	100
KFGX	First Presbyterian Church, Orange, Texas	1,200	250	500
KFBG	First Presbyterian Church, Tacoma, Wash.	833	360	50
KTW	First Presbyterian Church, Seattle, Wash.	833	360	250
WKAP	Flint, Dutee Wilcox, Cranston, R. I.	833	360	200
WDAL	Florida Times-Union, Jacksonville, Fla.	833	360	500
KFCP	Flygare, Ralph W., Ogden, Utah	833	360	25
WWI	Ford Motor Co., Dearborn, Mich.	1,100	273	50
WPA	Fort Worth Record, Fort Worth Texas	833	360	100
WIAJ	Fox River Valley Radio Supply Co., Neenah, Wis.	1,340	224	100
WSAL	Franklin Electrical Co., Brookville, Ind.	1,220	246	20
WOAD	Friday Battery & Elect. Co., Sigourney, Ia.	833	360	50
WABC	Fulwider-Grimes Battery Co., Anderson, Ind.	1,310	229	10
WIAC	Galveston Tribune, Galveston, Texas	833	360	100
WGAJ	Gass, W. H., Shenandoah, Ia.	833	360	20
WQAY	Gaston Music & Furniture Co., Hastings, Neb.	833	360	20
WGY	General Electric Co., Schenectady, N. Y.	790	380	1,000
WPAQ	General Sales & Engr. Co., Frostburg, Md.	833	360	10
WMAH	General Supply Co., Lincoln, Neb.	1,180	254	15
WAAS	Georgia Radio Co., Inc., Decatur, Ga.	833	360	20
KFDV	Gilbrech & Stinson, Fayetteville, Ark.	833	360	100
WAAK	Gimbel Bros., Milwaukee, Wis.	1,070	280	100
WIP	Gimbel Bros., Philadelphia, Pa.	590	509	500
WQAC	Gish, E. B., Amarillo, Texas	833	360	100
KFGY	Gjelhaug's Radio Shop, Baudette, Minn.	1,340	224	20
KDZX	Glad Tidings Tabernacle, San Francisco, Cal.	833	360	50
KJQ	Gould, C. O., Stockton, Cal.	833	360	5
KFFV	Graceland College, Lamoni, Ia.	833	360	250
WKAL	Gray & Gray, Orange, Texas	833	360	20
KNT	Grays Harbor Radio Co., Aberdeen, Wash.	1,140	263	250
KFEJ	Greason, Guy, Tacoma, Wash.	833	360	10

(To be continued next week)

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New DX Night Owl Records That Count

Two Lists to Make You Work

From D. Smith, 601 Russell Ave., Geneseo, Ill.

I HAVE been reading your paper a long time and am very much interested in the DX Nite Owl page. Here is my record on a crystal set using conventional hook-up: WOC, KYW, WDAF, WHB, WGY, KDKA, WJZ, WWJ, WCX, WLAG, WAAP, WAAF, KSD, WBAP, WFAA, WGM, WSB, WMC, WHAS, WLW, WOR, WCAE, WOS, WDAP, WJAN, 25 stations.

With Giblin-Remler coils and one tube hook-up I received the following list of stations: WSB, WDAP, WFAA, WLAG, WOC, KYW, WOS, KDKA, KSD, WLK, WHB, WIAK, WOAI, WDAJ, WIAS, WKY, WGM, WDAF, KHJ, WFAT, WAAE, WHAS, WBAP, WJZ, WWJ, WPA, WAAL, WBL, WJAP, WJAN, WIAO, WGY, WCX, WKN, WMAB, WBZ, WCAE, WOH, KFBS, WAAC, KFAF, WMAH, WGAY, KOP, WCM, WAAH, WFAP, WMAT, WBAQ, WOR, WEAF, WEAL, WMH, WHAZ, WAAN, WPAD, WNAD, KLZ, WLAL, WHAM, WNAJ, 9XAC, WMC, WRAM, WIAR, WCAS, WNAV, WAAP, WCAZ, IXAE, WOQ, WOAN, WBT, WHAA, WHA, WCK, WMAK, WGF, WNAB, WJAM, WFAJ, WSY, WWI, WHAB, WEAO, WKAA, WDAA, WGAS, WCAF, 9BDY, WPAC, KFBL, WIAA, WJAX, WAAW, WIAL, WHAH, WTAT, WTAU, WGR, WBAV, WWAD, WWB, WOAX, WBAS, WWD, WJAB, WHK, WIP, WDAO, WGV, KYY, KFBU, KXD, KFI, KWH, KDYS, KDZH, KGW, PWX, CJCG, CFCA, CKCK, CFCN, a total of 125.

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The One Tubes Have It

From J. Shaw, 207 Jefferson Ave., Charlotte, N. C.

I HAVE been an interested reader of the RADIO WORLD for some time and thought I would send you my DX records from the "Queen City of the South." I am using a hook-up with two variometers, one 23-plate variable condenser, one detector bulb. I have heard the following stations: KDKA, WWJ, WKAS, WGM, WOH, WOE, WIZ, WSB, KSD, WHK, KDPM, WEAF, WOC, WGY, WJZ, WOR, WJAX, WDAS, WLW, WHB, WEY, WXY, WJAK, WHAK, WKAA, WMAQ, WFAA, WQAA, WLAC, WLK, WBAC, WBZ, WHAZ, WBAP, WDAP, WHAB, WDAF, WHAS, WHAF, WCX, WAAP, WIK, WEAT, WRT, WEAE, PWX, WKAN, WEAI, WJB, WEAO, WKAG, WSY, WEAS, WIP, WMC, WLC, VBG, KYW, WMC, WAAX, WAAK, KLZ, KFBV, WOO, WOS, WHA, KYY, WFS, WNAP, WOAI.

* * *

Some More CR9 Records

From Herbert Jones, 170 Beach 81st St., Rockaway Beach, N. Y.

YOUR publication of the letter of M. Davidson, Jr., Laurence, L. I., prompts me writing this to thank you for putting me in touch with another Grebe C. R. 9 owner, and if you will I wish you would publish my list of DX to date. I purchased my set March 7 and received all my stations up to the first of April. The past week the static has prevented any DX work for me. I have an aerial only 22 ft. high. I would also like to hear from other Grebe owners.

Station "Frank H. Jones," Lunicu, Cuba; WFAA, WBAP, WOAW, WHB, WDAF, WLAG, WOS, WMC, WOC, KSD, WDAL, WSB, WGM, WDAJ, KYW, WMAQ, WDAP, 9XU, 9KP, WWAY, WHAS, WLW, WPAL, WWJ, WCX, WCAE, KDKA, WBAZ, WHAM, NAA, 8AWP, WNAC, WLAK, WGI, WGY, WBL, WHAZ, 2XAP, WIP, WOO, WFI, WDAR, WRW, and 12 "locals." Total, 56.

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

* * *

Stations to the Right of Them Volleyed and Thundered

From Jack Price, 305 Tattnall St., Savannah, Ga.

I HAVE been a constant reader of your valuable magazine for nine months and must say it is "up to the minute" on all the new dope. I have gained much enjoyment as well as useful experience in testing various circuits taken from your pages. Have logged 78 broadcasting stations in 28 States, one in Cuba and Porto Rico and north to CFCA, Toronto, Canada, and west to KHJ, Los Angeles, which I deem good results on one stage of audio with only "thirty-six foot" antenna. Have also heard KDKA, WEAF, WWJ, WDAP and WBAP, Fort Worth, Texas, on crystal alone. Wish some O. M. would send me hook-up for straight key, C. W. using sufficient power to work eight hundred miles. Would be glad to hear from fellow DXers, and gladly QSL.

* * *

Not So Worse—I'll Say

From E. L. Kennedy, Purcell, Okla.

I AM greatly interested in your DX Nite Owl section of the RADIO WORLD, so I thought I would submit my record made with a honeycomb coil tuner and two stages of audio-frequency amplification. I have heard about one hundred stations, but am only sending those over a distance of one thousand miles.

KHJ, KWH, KFI, KOG, KFCL, Los Angeles, 1,225 miles.

KPO, KUO, San Francisco, 1,450 miles.

KDYS, Great Falls, Mont., 1,175 miles.

PWX, Havana, Cuba, 1,350 miles.

WKAQ, San Juan, Porto Rico, 2,250 miles.

WGY, WRM, Schenectady, New York, 1,400 miles.

CFCA, Toronto, Can., 1,175 miles.

CHCF, Winnipeg, Can., 1,060 miles.

CKCK, Regina, Can., 1,160 miles.

WMAC, Cazenovia, N. Y., 1,350 miles.

* * *

A Rare Old Bird Is Right

From E. A. Guilbault, New Orleans, La.

I AM a constant reader of RADIO WORLD and have a stack of them with all the interesting news and sketches in them. I have been experimenting with wireless for a number of years and find that RADIO WORLD has the best reading matter as well as hook-ups of any radio magazine that is published. The DX Nite Owl is sure an interesting old bird. I am somewhat a Nite Bird myself, but since I've got my new set to working and joined the DX Nite Owls, I've been saving money by staying in more and getting good results out of my set. The circuit I am using is regenerative. My aerial is 4 wires 70 ft. long and 52 ft. above the ground; the lead-in is 40 ft. and I am using but one WD-11 tube. Here is my record from March 5 to March 10: WSB, Atlanta, Ga.; KFI, Los Angeles, Calif.; KYW, Chicago, Ill.; PWX, Havana, Cuba; WMC, Memphis, Tenn.; WBAP, Ft. Worth, Tex.; WKY, Oklahoma City, Okla.; WOC, Davenport, Iowa; WWJ, Detroit, Mich.; WGM, Atlanta, Ga.; KSD, St. Louis, Mo.; WHB, Sweeny School, Kansas City, Mo.; WOAI, San Antonio, Tex.; WAAB, Wichita, Kans.; WDAC, Chicago, Ill.; WLAG, Minneapolis, Minn.; WOR, Newark, N. J.; WXY, Birmingham, Ala.; WOS, Jefferson City, Mo.; WDAJ, College Park, Ga.; WDAF, Kansas City, Mo.; WCAY, Milwaukee, Wis. I think for a one bulb set this is a fairly good record within five days. I am stationed at 4533 Iberville St., New Orleans, La.

* * *

Crystals Aren't So Worse for DX After All

From C. Dunlap, Kinmundy, Ill.

I AM a reader of your weekly and think it is the most up to date radio journal I have seen.

I am sending you a list of stations I have heard with a set consisting of a home-made two-slide tuner galena detector and a pair of 2000 ohm Manhattan receivers:

Call letters	Location	Distance
KSD	St. Louis, Mo.	60
WMC	Memphis, Tenn.	275
WHAZ	Troy, N. Y.	850
WSB	Atlanta, Ga.	425
WPA	Fort Worth, Tex.	650
WRR	Dallas, Tex.	625
WLW	Cincinnati, Ohio	225
WWJ	Detroit, Mich.	400
WOS	Jefferson City, Mo.	200
		3,780

* * *

Here's Your Chance—Owls

From Walter R. Scott, 285 Montague Place, So. Orange, N. J.

I AM sending a list of the most important DX stations I have received, hoping it will interest the "DX Nite Owls."

PWX, WBAP, WHB, WOC, WDAF, CFCA, KYW, KDKA, NAA, WBT, WBZ, WFI, WOO, WIP, WDAR, WGR, WGI, WHK, WLW, WMC, WMB, WSB, WGM, WWJ, WBAX, WBAZ, WCAE, WDAP, WEAS, WHAM, WHAS, WJAX, WMAF, WNAC, WNAL, WHAZ, WGY, WMAK, WLAK, WCX.

My set is a WD-11 tube, variocoupler, variometer and variable condenser. I will send my hook-up to any one who desires it provided a stamped envelop is sent for its return.

* * *

Records from Whaletown

From Benjamin Smith, 57 Prospect Street, New Bedford, Mass.

WHAT I received on a single U. V. 200 tube with a hook-up of the consolidated plan. I made my own variocoupler of No. 22 D. C. C. wire:

WCAS, WDAU, WDAY, WDY, WEAF, WEAN, WFI, WGAF, WGI, WGR, WGY, WHAF, WKY, WHAM, WHAT, WHAS, WHAZ, WIAP, WJAR, WJAX, WJAZ, WJC, WJD, WJZ, WLK, WLW, WMAC, WOC, WOO, WOZ, WQAQ, WWI, WWJ, WWT, WWZ, WOAP, NAF, PWX, KYW, WAAF, WLD, WJAP, CFCA.

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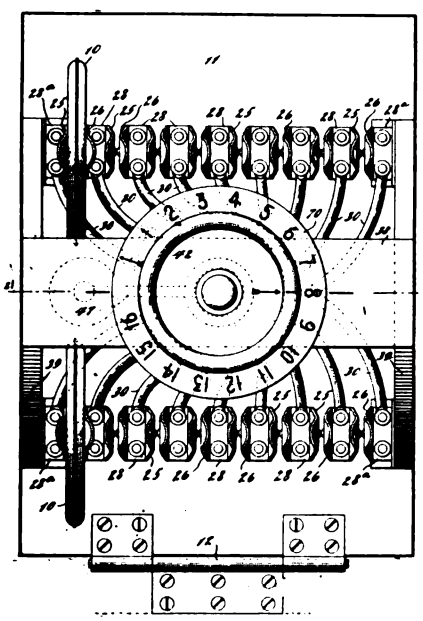
Latest Radio Patents

Spark-Gap Apparatus

No. 1,451,428: Patented April 10, 1923. Patentee: Lawrence J. Lesh, New York City.

This invention relates especially to spark gap apparatus for use in radio transmitting and receiving sets, the invention not being confined in all its features, however, to spark-gap apparatus. More particularly the invention relates to spark-gap apparatus of the multiple unit gap type, and the invention aims generally to



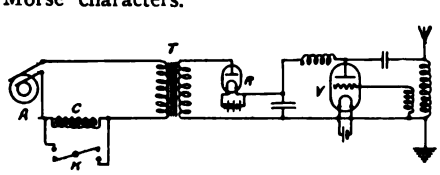
New method of arranging the units of a quenched gap for easy removal and adjustment.

provide improved apparatus of this type of a simple and compact construction and which shall provide for convenient and ready removal and replacement of the spark-gap units and for convenient adjustment of the circuit for connecting any desired number of the units and any desired group of the units in the circuit, and to provide an improved spark-gap unit. The invention consists in the features of construction, arrangement and combinations of parts herein disclosed and specifically pointed out in the claims.

Wireless Transmitter

No. 1,454,586: Patented May 8, 1923. Patentee: W. T. Ditcham, Twickenham, England.

The object of this invention is to provide an improved valve transmitter in which the transmission of the interfering noises known as key clicks may be obviated and the valve or valves may be relieved of the full load during the spacing periods of the Morse characters.



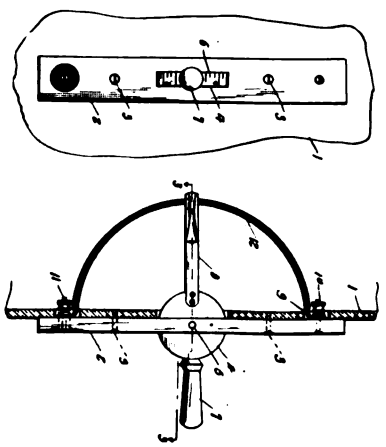
An improved valve transmitter.

According to this invention I connect in the primary power circuit of a valve transmitter a choke coil if the primary current is alternating, or a resistance if the primary current is direct, and I provide a key or switch by means of which this choke coil or resistance may be shortcircuited for the purpose of signaling. The choke or resistance should be of such a value that when it is not shortcircuited the valve will continue to oscillate but will only generate a small current compared to its normal working current. Thus signals can be transmitted by varying the strength of the oscillations without stopping their production or sensibly varying their frequency.

Radio Variable Rheostat

No. 1,452,399: Patented April 17, 1923. Patentee: Herman W. Tompkins, Greensburg, Pa.

The present invention has relation to radio apparatus and more particularly to a variable rheostat which is simple in its



Variable rheostat of new and novel construction.

structure and arrangement of parts, whereby it may be readily assembled and economically constructed, and which is accessible for any required purpose.

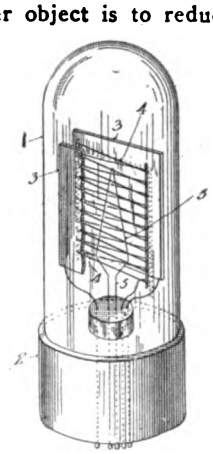
Electron-Emitting Cathode

No. 1,453,287: Patented May 1, 1923. Patentee: James L. Bradford, New York City.

This invention relates to the manufacture of the heated element, such as the filament, or electron-emitting cathode member of an audion or vacuum tube, and particularly to the element referred to, as an article, as well as to the method of making the same.

The object of the invention is to provide a filament or electron-emitting cathode of greatly increased durability and constancy of activity, for use in audions or vacuum tubes.

A further object is to reduce the cost

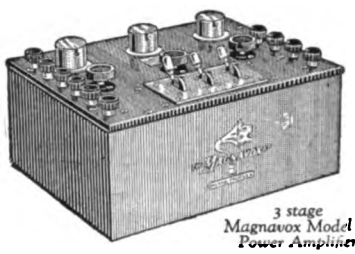


Bradford's improved electron-emitting cathode.

of manufacture of such devices while securing greater length of life thereof, and increased efficiency.

A further object is to provide an element of the nature and for the use referred to which requires less current in the use thereof, thereby reducing the cost of operation of audions or vacuum tubes in connection with which the element is employed.

MAGNAVOX
Radio Products



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Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Joseph Spolarich, 210 Ruby St., Joliet, Ill. (Radio supplies.)
J. W. Austin, 121 Warren St., Lexington, Ky. (Radio service.)
Broadway Radio Shop, F. Paradise, 77 Broadway, Astoria, L. I., N. Y. (Retailer.)
H. C. Keich, 715 Wauponsee St., Morris, Ill.
C. A. Hilton, Jr., Box 140, Valatie, N. Y.
H. & H. Radio Supply Co., 5409 Indiana Ave., Chicago, Ill. (In market for 300 cardboard or fiber forms for spiderweb coils.)
L. H. Weaver, 1500 Hayes St., Birmingham, Ala.
Grover C. Zink, 226 North Centre St., Cumberland, Md.
George S. Crosin, 5225 Greenway Ave., West Philadelphia, Pa.
Joseph E. Doughton, Guilford College, N. C.
J. M. Fiscus, 522 Clinton St., Steubenville, Ohio.
R. R. Eckart, 1106 Parkview Ave., Dallas, Texas. (Wants two 500-ohm Ward Leonard resistance units.)
O. A. Gilles, Mechanicsville, N. Y. (Free lance radio salesman.)
J. F. Fairman, 229 West 58th St., New York City.
Edgar A. Davis, 29 Belknap St., Dover, N. H. (Makes and sells sets.)
Samuel Wald, 501 Marcy Ave., Brooklyn, N. Y.
I. H. Flood, Chelsea-on-the-Hudson, N. Y. (Wireless supplies.)
Harold A. Symons, 7323 Gratiot Ave., Detroit, Mich.
J. Severon Hartman & Son, 1309 Constance St., Los Angeles, Calif. (Will sell any reliable radio line.)
Chas. A. Hines, 133 Rowland Ave., Eagle Rock City, Calif.
L. L. Turner, 406 North Mangum Street, Durham, N. C.
H. B. Clark, 4130 Ashland Avenue, St. Louis, Mo. Radio 9DVP. (Interested in both transmitting and receiving apparatus.)
Edw. R. Sheehan, 314 Helmer Street., Kewanee, Ill. (Interested in Reinartz and Armstrong.)
Robert Kiggins, 508 East Euclid Street, Delphos, Ohio.
E. G. Barnes, General Delivery, Mt. Vernon, Ohio. (Builder and retailer.)
W. K. Buckley, P. O. Box 89, Salem, Mass.
Wm. Bivins, Eminence, N. Y.
W. E. McCan, 3741 Sixteenth Avenue, South, Minneapolis, Minn.
Darwin S. York, 424 Clay Avenue, Scranton, Pa.
Harold Schegel, 524 Second Street, Ann Arbor, Mich. (Builds radio sets.)
Stanley Delmar, 231 Allegheny Avenue, Fairmont, W. Va.
F. C. Hendershot, Spencer, Indiana.
Francis J. B. Leonard, 750 North State Street, Chicago, Ill.
E. S. Akin, 1520 South State Street, Syracuse, N. Y. (Wants catalogues of high class radio sets.)
Chas. R. C. Ham, care Wilson & Co., P. O. Box 615, Hongkong, China.
Economy Radio Supply Co., 1506 Lexington Avenue, New York City.
Joseph Schwartz, 3409 Beniteau Avenue, Detroit. Mich.
Lee Grubb, R. D. No. 1, Millerstown, Perry County, Pa.
I. N. Mitchell, 680 Fifth Avenue, New York City.
The Duluth News Tribune, Radio Editor, Duluth, Minn.
Lester O. Burton Maple Shade, N. J. (Distributor. Has demand for portable sets.)
William J. Vandercar, 63 Howard Street, Cohoes, N. Y. (Will soon stock parts and supplies.)

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for $1.00. Radio World, 1493 Broadway, N. Y.

"Elements of Radio Communication"

"Elements of Radio Communication." A book for the engineer, amateur, student and layman, by Ellery W. Stone, 445 pp. 145 diagrams, 39 plates. D. Van Nostrand Company, New York.. Price, $2.50 net.

This is a second edition of Lieut. Stone's book revised and enlarged. Much new material and recent data on radio-frequency generators, air-craft radio, vacuum tubes and radio-telephone broadcasting are included in this edition. The book seems to be well adapted for classroom work as well as self instruction for radio amateurs and, in fact, any one interested in the art.

New York Radio Show Planned for September

PLANS are being formulated by the American Radio Exposition Company to hold another radio show in New York City. The last week in September has been mentioned as the opening date, but a definite announcement is expected in the near future. It is probable that the show will be held in either the Sixty-ninth Regiment Armory or the Seventy-first Regiment Armory. All inquiries should be addressed to J. C. Johnson, American Radio Exposition Company, 120 Broadway, New York City.

Radio Department Buyer and Manager Wanted

EDITOR RADIO WORLD: We have an opening in one of our large Radio Departments in the East for a buyer and manager. We want primarily a merchant and one who can promote sales. If you have some one in mind that you think is especially good and who has been running a successful Radio Department, we would like very much to get in touch with him.

Yours very truly,
RETAIL RESEARCH ASSOCIATION.
225 Fifth Ave., New York City.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

PACFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Calif., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Calif.

CANADIAN ELECTRICAL ASSOCIATION, Montreal, Canada, June 21-23, 1923; Louis Kon, secretary, 65 McGill College Avenue, Montreal, Canada.

Farmers Need Radio Sets

MR. E. S. AKIN, president of the New York Draft Horse Club, of Syracuse, N. Y., is a radio enthusiast and a valued reader of RADIO WORLD. He expresses the opinion that, if properly demonstrated, radio outfits could be sold more generally to farmers in central New York.

A New Federal Transformer

The Research Division of the Federal Telephone & Telegraph Company, Buffalo, N. Y., has during the last year made several interesting discoveries in its work on the theory of and means for the faithful reproduction of music. The results of successive trials have proven beyond doubt that what the ear of the observer needs for complete satisfaction in music is the presence of the lower tones of the orchestra. Its lack leaves a distinct feeling of dissatisfaction and insufficiency in the music while its presence gives a completeness and satisfaction that constitutes the difference between good music and what the radio listener has been forced in the past to accept.

While the problem of the loss of the lower tones is as serious in the transmitting equipment as in the receiving equipment, the fact that one transmitter serves many thousands of listeners has justified the great investment necessary for the construction of special faithfully reproducing microphone and voice amplifying equipment. But the problem of designing equally good equipment for the radio listener has been attended by the same difficulties and with the added limitation that the selling price of such equipment must be well within the reach of the radio listener.

The methods for the elimination of these many difficulties lie in the careful design of the amplifying transformer. The matter is one that requires the greatest possible care in choice of proportions, nature of the materials involved, and their more careful fabrication and assembly.

The No. 65 Federal transformer has been designed to eliminate the objections that have so limited reproduction in the past. Its design and construction is such that the notes of the bass viol, the kettle drum, the piano bass are carried through the system with a completeness and faithfulness that is amazing.

It is of such construction that each note that enters it is passed on to the vacuum tube with exactly the same fidelity and without a suggestion of any added tones, whether dissonant or not. And, when used with UV-201, WD-12, UV-199, or any of the other commonly available tubes the degree by which this exceptionally satisfactory amplification exceeds that which has yet been available with any A. F. transformer is said to be almost unbelieveable.

New Radio and Electric Firms

Electronic Corp. of America, Philadelphia, $600,000. (Corporation Guarantee & Trust Co.)

Economy Radio Supply Co., dealers in radio sets and parts; 1506 Lexington Ave., New York City. H. Hirschfield and others.

Fall Kill Radio & Electrical Corp., Poughkeepsie, N. Y., $50,000; J. A. Purcell, J. B. Grubb, W. A. Cronk. (Attorney, T. Purcell. Poughkeepsie.)

Nolte Mfg. Co., 61 Gautier Ave., Jersey City, N. J., to manufacture Reinartz coils.

Rhason Radio Corp., New York City, $50,000; R. J. and C. R. Heitman, H. A. Datter. (Attorneys, Halbert & Quist, 1293 Myrtle Ave., Brooklyn).

Windham Valley Electric Co. has increased its capital from $25,000 to $75,000.

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Answers to Readers of Radio World

Will the three tube reflex circuit using the Grimes inverse duplex principle give as good results as a set employing three stages of radio-frequency, crystal detector and two stages of audio-frequency?

Can the R. C. A. Radio 1714 and Audio 714 be used in this circuit?

Which is the better tube for use in the circuit, the U. V. 199 or the 201A?

How can I make small neutrodyne condensers?—F. W. Logren, Box 649, Virginia, Minn.

You will get louder signals in the set employing three stages of radio, detector and two of audio. With the reflex you will obtain signals equal to two stages radio, detector and two of audio. The advantage of this circuit is the saving in tubes and in current. You can employ the transformers you mention. Either of these tubes will function properly, but you will obtain slightly more volume by using the 201. See article by J. E. Anderson in this issue on neutrodyne condensers.

* * *

I have been experimenting with the Reinartz tuner hook-up and have had good results but with one exception. I cannot get many amateur stations. I have been told that my antenna is too long for this. It is 310 feet long, fastened to a tree at one end and the gable of the house at the other. Should I cut it down? This is about the only place that I can conveniently place it.—Arthur Greben, Liberty, New York.

The antenna you mention is entirely too long for reception of amateur signals. One hundred or 150 feet at the most is plenty for all waves that you wish to receive. You will get better results and sharper tuning with a small antenna. You can run your wire out for 100 feet, fasten your insulator, and support the rest of it on rope. That will serve the purpose.

* * *

I have a crystal set comprising a loose coupler, variable condenser, fixed condenser, phones and Turney Crystalor detector. Can I use any of this apparatus in the construction of a single tube set? What will be my range using one of the WD-11 tubes and the apparatus mentioned? Would putting a one stage amplifier on my present set increase the distance over which I can receive? How far can the average crystal set be relied upon to receive with an outside antenna and the best apparatus obtainable? —Alfred Wagannor, Utica, Utica, N. Y.

You can use the loose coupler, variable condenser, fixed condenser and phones in the set you intend making for the WD-11. It is impossible to state the range of any receiver. The only method you can pursue is to construct the receiver and try it out for yourself. It would not increase your range to add an amplifier, as an amplifier will not boost anything that is not audible in the detector circuit alone. It would make louder the signals that you now receive. The average crystal set is good for 50 to 75 miles on telephone and 100 to 150 miles on spark work at the best average times. Freak reception has been covered over longer distances, but the consistent range of crystals is not large.

* * *

Enclosed please find a diagram of a circuit described in Radio World *for Jan. 27, 1923. Would it be possible to put radio-frequency on this circuit? If it is possible, what apparatus is necessary?—Gerald R. Duncan, Fayette, Iowa.*

It is not possible to put radio-frequency amplification on this circuit without destroying the basic principle of its operation.

* * *

In Radio World *for Feb. 24 you describe the Flewelling circuit. Will a* WD-11 *be suitable for this circuit? What voltage is necessary on the plate?—W. C. S. Holden, Valdosta, Ga.*

You can use this tube in the Flewelling circuit. The plate voltage should be 45-60 for volume, although 22½ will work, but with poor success.

* * *

Where can I obtain the neutrodons and neutroformers necessary for the Hazletine neutrodyne circuit? What tubes should be used with this circuit, and what is the type of radio transformer used?—John C. Kerr, 160 Broad St., Providence, R. I.

You can obtain the apparatus you desire from Freed-Eiseman Corporation, 255 Fourth Ave., New York City. For best results the U. V. 201A should be used with this circuit. No radio frequency transformers are used with this circuit, the neutrodons taking their place.

* * *

What is the best type of transformer to use in connection with adding two stages of audio-frequency to the set described by Orthcrus Gordon in Radio World *for Jan. 20. I have R. C. U. V. 712, but have been told that they will not work in this circuit. Would a phone condenser bridged across the phone terminals improve this circuit to any extent? What capacity should it be?—A. M. Wiggins, Box 463, Jacksonville, Fla.*

The transformers you mention are perfectly o. k. for use with this circuit and whoever has been telling you differently is wrong. You can use such a condenser. It would not improve your reception to any great extent, but would make the signals clearer to some extent. It should be .001.

* * *

How many turns of No. 22 D.C.C. wire will be necessary to wind on a tube 4 inches in diameter and 4 inches high to enable me to receive broadcasters? There is to be ⅞-inch left for rotor mounting. What ratio transformer is desirable for the first stage of audio-frequency using WD-11 tubes? What for the second stage?—Alfred R. Golze, 1715 Corcoran St., N.W., Washington, D. C.

Thirty-five turns on each side of the division will be sufficient for all your needs. This will make the winding about 1½ inches on each side of the ball and will allow sufficient for each end. A transformer of 9-1 is preferable for the first stage and one of 4-1 for the second.

* * *

Will I be able to work the Cockaday four circuit tuner set published in Radio World *for May 12 on WD-11 tubes? Must the sizes of the windings be strictly adhered to?—F. M. McCormack, 158 Webster Ave., Providence, R. I.*

The circuit mentioned will work on WD-11 tubes but you will not get the volume that you would get out of the 201 or 201A tubes. The small change in the size of tubes you mention should not make any great difference.

* * *

Will the Cockaday circuit get all the new stations operating on the new wave lengths? Does the information on the construction of the coils have to be strictly adhered to? What should the ratio of the transformers specified be?—Jos. Spolarich, 210 Ruby Street, Joliet, Ill.

The coils specified will allow you to get all the new stations with the aid of an antenna about 100 ft. in length. It is best to follow the instructions exactly. The first transformer specified (Amertran) is 9-1 and the second 3-1. This, with the proper B battery voltage, will allow operation on a loud speaker.

* * *

Is it possible to obtain peep hole milliameters with a range of .0 to 1? Will such an instrument placed in the plate circuit of a regenerative set have any effect on the working of same? Will it allow the condition of the B battery to be told?—E. L. Thomson, Maranville, Tex.

Milliameters are not made for peep hole mounting. The small size is 2½ inches in diameter and can be obtained at or through any electrical store. Such an instrument placed in the plate circuit will have no effect on the working of the set. It will allow you to tell the condition of your battery to a certain degree, but not as authentically as a voltmeter, as the amount of amperage in such a battery is extremely small at best.

* * *

Enclosed please find the circuit described by Mr. Stoup in Radio World *for May 12. How should variable condenser C1 be connected in circuit to prevent capacity effects? Do arrows on rheostats and potentiometers mean movable arms? Would a dry cell be strong enough to operate the tube? Should plus of B battery go to plus of socket? In sketch, the plus of A battery also goes there. What is the capacity of C3 and C4? Does ground of secondary circuit that goes from the plus of the A circuit have to be a separate circuit from the primary ground? —J. H. Curtis, 1314 W. Front St., Plainfield, N. J.*

The rotor of the condenser should connect to the side of the secondary going to the grounded side of the filament circuit. The arrows signify the movable contact arms. A dry cell will operate this circuit if a WD-11 is used. The plus of the B battery always goe to the plate (marked P on socket). You evidently have your connections mixed. There are two filament connections on a tube socket, marked FF or F+ and F— or — and +. The plate and grid are marked P and G. Do not get these mixed up simply because the plus of the B battery goes to the plate. Do not make the mistake of connecting the B battery in such a manner that it will cross the filament leads, or you will burn out your tube. The best method to pursue in preventing this is to place an ordinary electric light bulb of either 60 or 75 watts in the B battery leads to act as a ballast lamp. If by chance there is a direct circuit, the bulb will take care of excess current and will prevent you from burning out your filament.

* * *

Where can I obtain a complete hook-up for the WD-11 receiver published in Radio World *for March 3, on page 9, by C. White?*

What voltage is the best for the B battery circuit in this hookup?—Henry W. Schwab, 201 Buell Street, Muscatine, Ia.

The entire hook-up was shown on the page you mention. We do not supply blue prints of circuits. 22½ volts on the plate will be enough for all WD-11 tubes when used as detectors.

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HAZELTINE
NEUTRODYNE
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FREED-EISEMANN
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Complete wiring diagram, instructions, etc. sent in special container with patented essential parts. Three NEUTROFORMER COILS mounted on variable condensers, and DOUBLE NEUTRODON (as illustrated), sent for $21.50. Ask your dealer to show you these parts, as well as complete assembled five-tube Neutrodyne Set in mahogany cabinet, Model NR-5, $150.

Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

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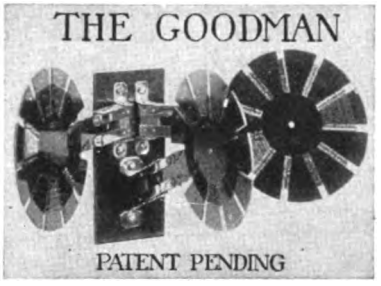

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SUPERSPOT
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sensitive over its entire surface
Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.
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TUNER COILS
Complete as per specifications.
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Bankwound. Price, $2.75
Hook-up, directions and material list furnished free with each set of coils.
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Dealers, Communicate
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22 Warren Street, New York, N. Y.

Baseball Writers Protest Broadcasting Baseball Plays

THE Baseball Writers' Association of America is opposed to the radio broadcasting of baseball results from major league parks throughout the country, it became known last week when the association wired Commissioner Landis and Presidents Heydler and Johnson, of the National and American Leagues, protesting against alleged granting of permission to a radio corporation to provide facilities for this purpose.

The telegram, signed by Frederick G. Lieb, of New York, president of the association, and Joseph M. McCready, of Philadelphia, secretary, is as follows:

"Understand permission has been granted to a wireless corporation to broadcast results of games at Polo Grounds and other parks throughout the country, giving detailed results play by play. If this is permitted, it will kill circulation of afternoon papers and in the end will result in curtailment of baseball publicity.

"The Baseball Writers' Association is strongly opposed to allowing any wireless connection with the baseball parks which would allow broadcasting stations to give details while a game is in progress."

Farmers Benefit by WOC's Broadcasting Schedules

That the daily broadcasting schedules given by Station WOC, owned and operated by the Palmer School of Chiropractic, at Davenport, Iowa, are of special benefit to the farmers is becoming more evident continually.

Farmers who have not already installed receiving sets visit their neighbors who have this wonderful new means of communication with the daily activities and see what benefits are to be derived.

The inspiration behind the Palmer School of Chiropractic has always been that of public service, and this institution has ample opportunity to carry out this idea of service through its radio programs. Located as it is in the middle west, and the center of a large farming population, it has been mindful of the fact that a large percentage of its potential audience is made up of farming folk and has endeavored to make its schedules of interest to them in particular.

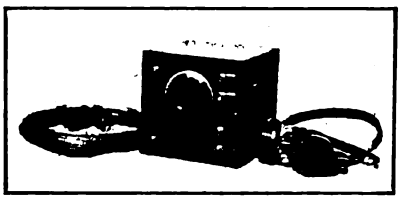
Blue Law Silences Radio Loud Speakers

MANY years ago, the Elizabeth, N. J., Board of Works passed an ordinance prohibiting peddlers and others from making noises on the streets. This ordinance was invoked last week to stop the use of large phonograph horns in front of stores of radio dealers. Chief of Police Mulcahy says the use of these horns violates the ordinance as a "nuisance." The dealers argue that the ordinance was passed before radio was thought of, but the Chief was obdurate and said the use of horns to distribute radio messages will have to end. The dealers indicated they will fight the police ruling.

Performing Artists Now Want Broadcasting Royalties

IT is now rumored that the performing artists will demand revenues from the broadcasting stations for giving other types of entertainment than music. Payment to singers and dance orchestras is said to be among the possibilities.

The Radio (Trade Mark) Flivver



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YOU SAVE 50% OF THE USUAL COST

WORLD BATTERIES FOR RADIO

6 Volt 60 Amps.	$10.00
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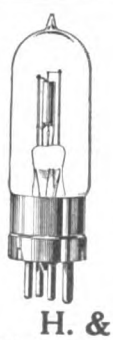

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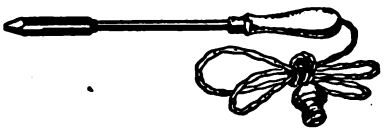

A Complete Electric Soldering Iron Ready for Use. Will Operate on Either A. C. or D. C. Ideal for Radio Work.

$2.25

Phones

Nerco	$2.50
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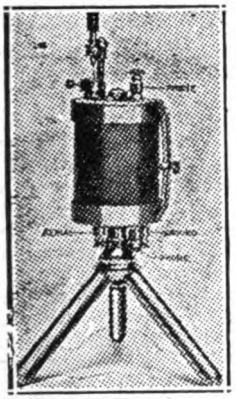
Loud Speakers

Murdock	$2.25
King Amplitone	3.25
Small Woodehorn	2.95

Gem Crystal Receiving Set. Simple, Clear, Efficient and Beautiful.



Set Only

$3.25

Complete with Antenna Outfit and $5 Pair of Phones

$6.95

PLENTY OF WD 11-12
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etc., Tubes in Stock Now
at Cut Prices.

Audio Trans.	$2.25	7x18 Panels	$ .75
Radio Trans.	1.95	VT Sockets	.25
Aerial Wire	.35	Cockaday Coil	1.75
17 P. Var. Cond.	2.50	Phone Plug	.45
23 P. Var. Cond.	2.75	Light. Arrest.	.75
43 P. Var. Cond.	3.00	Rubber Ear Cap.	.75
3" Dials	.20	22½ V. Bat.	.75
Rheostats	.28	Homecharger	12.95
Variometers	1.50	Thord. Trans.	2.50
Bradleystats	1.35	D.C. Charger	9.95
WD 11 Sockets	.20	R.C.A. 712 Trans	5.10

All Other Nationally Advertised Radio Apparatus in Stock and Sold at the Lowest price in the Country on a "Money Back Guarantee Basis."

RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

The Rand McNally Radio Map of United States is 30x40 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

Price 35c Each

THE COLUMBIA PRINT

1493 BROADWAY NEW YORK CITY

Features of the Program at WGY Next Week

RADIO listeners tuned to WGY, the Schenectady broadcasting station of the General Electric Company, Sunday evening, June 10, will have an opportunity to take part in the opening service of the 127th Commencement of Union College. On that evening Dr. Charles Alexander Richmond, president of the college, will deliver the baccalaureate at the First Presbyterian Church. Several Schenectady clergymen will take part in the service.

A feature of the week of June 10 at WGY will be a program by the Monday Musical Club of Albany, N. Y., under the direction of Mrs. Ralph G. Winslow, Monday, June 11.

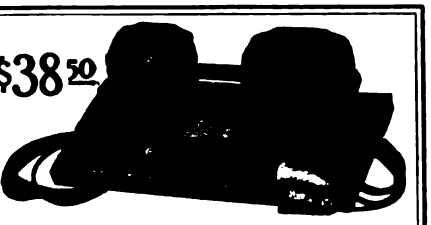
Frederick J. Clinnick, cornetist, will be featured on the program for Tuesday, June 12. A Flag Day address will be delivered by the Rev. William E. Compton, Thursday night, June 14.

"Clarence," a comedy by Booth Tarkington, will be presented by the WGY Players Friday night, June 15, with Edward H. Smith as Clarence. At the late concert, Friday night, an all Irish program will be presented.

Broadcast Designations—Not Official!

Now that what is known in newspaper offices as the "silly season" is approaching, it is but natural that radio should come in for its share of nonsense. The first attempt to reach RADIO WORLD is the following list of well known broadcasting stations:

WOR—"Waves of Romance."
WJZ—"With Jazzy Zip."
WJY—"With Just Youthfulness.
WHN—"We Hinder Not."
WEAF—"We Exploit All Favorites."
WHAZ—"We Handle All Zones."
WGY—"We Grow Younger."
WOC—"We Oversee Crops."
WHAM—"We Handle All Matters."
WSB—"We Slay Bollweevils."
WDAP—"We Do Atlantic-Pacific."
PWX—"Please Wire Xchange."
WAAM—"We Are Active Merchants."



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WHY pay good money out constantly for recharging batteries when the Ohio Motor Generator will do it quickly at a slight expense. This inexpensive home charging outfit keeps your Radio in service all the time and pays for itself—by charging your neighbors' batteries. It is noiseless, gives no trouble, and will even recharge totally exhausted batteries quickly.

The set is made up of the celebrated Ohio A C motor and D C generator wound for 6-10 volts. The motor and generator have ball bearings and are of the highest grade construction. It has none of the troubles common to cheap charging sets and will last a lifetime. It will charge quickly any three cell automobile or Radio "A" battery. Furnished complete on a substantial base with ammeter and field rheostat to adjust the charging rate from one to twenty amperes. The motor is for 60 cycle, 110 volt service and is complete with ten foot cord and attachment plug ready for instant connection and operation. Full instructions provided.

Motor and generator can be specially wound to charge six cell batteries or other unusual conditions.

Price $38.50 f. o. b. Cleveland. Ship by Express C. O. D., weight sixty pounds. Send your order today and stop paying good money for recharging. Your money back quick if not satisfactory.

NOTE:—If your service is other than 60 cycle, 110 volt, ask for special price.

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WD 11 Hook-up Positively Free of Body Capacity

also giving selectivity, sensitivity, and record distance. GIVEN FREE with purchase of any article listed:

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3 Plate Condensers	1.25
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Freshman Grid Leak and Condenser	.90
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Fully wired, ready for use.

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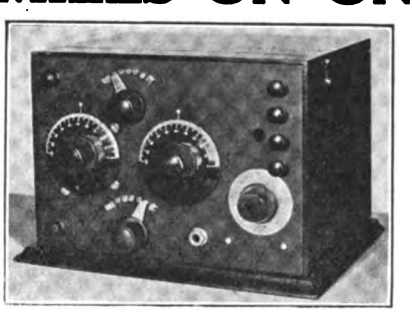

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17 plate SUNBEAM QUALITY condenser, heavily nickel-plated, handsome finish, all Bakelite Mt'g. Adapted for the COCKADAY circuit, $2.88

Triple Bank-Wound Coil, Silk Wound, to meet the new Government regulation wave-lengths now being allotted. Furnished with hook-up and instructions $3.25

Sunbeam Detector $45.00
Sunbeam 1 Step Amplifier..... 75.00
Sunbeam 2 Step Amplifier..... 125.00
(Complete with Tubes, "B" Battery, "A" Battery. Phones, Aerial, etc.)

Sunbeam Detector and 1 Step.....$12.00
Sunbeam Detector and 2 Step..... 18.00
Also 2 Step Unit 14.50
Assembled Jacks, Sockets, Transformers, etc., ready in one piece for mounting. Most compact unit available.

SUNBEAM ELECTRIC CO.
71 THIRD AVENUE NEW YORK

Directive Radio Transmission on a Wave Length of 10 Meters

UNDER this title the Bureau of Standards has issued Scientific Paper No. 469 by Francis W. Dunmore, Associate Physicist, and Francis H. Engel, Assistant Physicist, of the Bureau. An abstract of the paper follows:

Interference between different radio transmitting stations can be reduced by the use of markedly directional antennae for transmitting and receiving and by the use of short wave lengths not at present employed. For broadcasting, such as the transmission of market reports or music, directional antennae are not suitable for transmitting, but can be used for reception. For point-to-point communication—that is, from one transmitting station to one receiving station—directional antennae can advantageously be employed for both transmission and reception. Radio communication has so far been carried on, with few exceptions, on wave lengths of not less than 200 m. The use of much shorter waves, such as 10 meters, with the accompanying reduction of interference, has not been adopted to any extent. Experiments recently made by Marconi and others have shown them to be practicable.

This paper describes a series of experiments in radiotelegraph and radiotelephone transmission on a wave length of 10 m. using at the transmitting station a reflector consisting of short, vertical wires arranged as elements of a parabolic cylinder. The system described, therefore, employs two means of reducing interference. In the work described in this paper a 50-watt electron-tube generating set was employed. The capacity between the elements of the tube, together with the grid and plate coupling coils, formed the generating circuit. Waves were radiated from the generating set by two short, vertical, multiple-wire conductors, one placed above and one below the generating set. A coupling coil was connected between the two vertical conductors, and the generating set thus coupled to the system. The generating set with the vertical conductors was suspended in the focal axis of the parabolic cylinder. Each wire of the reflector was tuned separately to 10 m. by adjusting its length. With all adjustments of the reflector correctly made, good directional transmission was obtained. At least 75 per cent of the radiated power was confined to an angle of 40°.

Studies were made of the effect of removing the wires near the center of the reflector, of removing alternate wires in all parts of the reflector, of detuning the wires, and of varying the aperture of the reflector. For studying the radiation characteristics of the system, a single-turn loop-receiving antenna was used with a small condenser, thermo-couple, and micro-ammeter. Measurements of received current were made with this receiving apparatus while the transmitting reflector was rotated. Radiation characteristics for various adjustments of the reflector are shown by means of polar curves.

The paper gives the constructional details of the apparatus employed, so that any person interested can duplicate the apparatus used and the results obtained, and can continue in this line of investigation.

131 WEST 37TH STREET, NEW YORK CITY

Something Really New!

The Ideal Set for Travel, Home or Camp

The set that has taken New York by surprise. Its *loudness* is equal in volume to One Stage of Amplification on a good set. There is only *One Control.* Extreme simplicity is attained by the use of one dial. A *selectivity* which will tune in and out of local and distant stations when the traffic is heavy. In *distance* it has surpassed the best regenerative sets. A 200 to 1,250 meter range makes it possible to neatly handle the *new wave lengths.*

All this is enclosed in a trim cabinet *2" x 6" x 8".* Think of that for convenience! It only *weighs 2 lbs.* when *packed* ready to mail.

By organizing our production on a large basis we have been able to use the best materials and still sell this Wonder Set at only **$12.50**

Special discounts to dealers.
Attach Money Orders to Mail Orders. Postage Must Accompany Mail Orders.

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(FOR NEW SUBSCRIBERS ONLY)

In order to materially increase our subscription list we are offering for a limited time a special subscription of eight issues of Radio World for $1.00. You may begin your subscription now, or have us start sending the first issue on this subscription offer when you go out of town.

CUT OUT THIS TODAY SO THAT YOU WILL NOT FORGET ABOUT IT

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Enclosed find $1.00, for which send me Radio World for eight issues, beginning with your number dated.....

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Three Months 1.50
Add $1.00 a year for foreign postage.
50 cents extra yearly to Canada.

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French Radicals Attack Broadcasting

The radical newspaper *L'Ere Nouvelle* published last week a violent attack on radio broadcasting on the ground that it is undemocratic. The New York *Sun* correspondent at Paris cabled his paper the following quotation from the attack:

"It is possibly the hardest blow ever struck at democracy. Wireless telephony contains nothing equitable. By the fashion in which it is organized it institutes a despotism. Speech becomes a monopoly in law and in fact. The people become a mute whose ears are filled with what the authorities decide to give them.

"Two kinds of things will be given this mute. First, unimportant facts and items of news. Then will come tendencious news designed to provoke simultaneously everywhere the passions of the crowd by official discourses and Government hints or indications useful to the economic and financial powers associated with the Government.

"Directly or under cover of limited liability companies the Government and reaction will be able to say to millions of listeners just what they want them to hear and there will be no contradiction."

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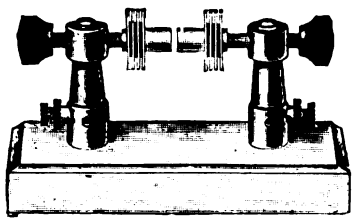

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This Spark Gap is suitable for all stations up to ¼ K. W. capacity. List $2.40.

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AMRAD ¼ K. W. SPARK TRANSFORMER $4.00

GALENA CRYSTAL DETECTORS

They are absolutely free from distortion. Music received is exceptionally good. List $2.50.

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Complete line of Eldredge, Jewell, General Radio, Roller-Smith, Hoyt, Weston, and Sterling Voltmeters, A C and D C, Ammeters and Hot Wire Ammeters.

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All orders must include postage, and all checks must be certified.

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Exceptionally good proposition. Assigning Territory Rapidly.

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THE COMO DUPLEX TRANSFORMERS

Something really new in Audio Amplification. (See article, this issue, by C. White, on "A Super Amplifier.") We guarantee more volume and infinitely better quality than is possible with any other transformer on the market.

Sold only in matched pairs

PRICE $12.50 PER PAIR

Send for descriptive literature

Como Apparatus Company

168 DARTMOUTH STREET BOSTON, MASS.

Old WJZ's Senior Operator Becomes Chief at WBZ

WITH the closing down of old WJZ in Newark, N. J., came the passing of many familiar radio personalities. OHN is one of them. In real life he calls himself Harry E. Hiller. As the letters indicate, he was the senior operator attached to the Newark staff. And now, after the shutting down of the famous old station, he is going to WBZ, the Westinghouse Station in Springfield, Mass. He will become its chief operator, and will bring with him some of the fame which belongs to old WJZ.

The story of OHN is the story of WJZ. Hiller is a seasoned radio man, and an old hand at the game. He started his radio activities in 1912 presumably stringing a flimsy antenna on the paternal roof, as many youths of the period were wont to do. He secured a government license and after successfully passing the examination, was assigned a transmitting call 2IH.

It was then that he decided to pursue radio as a career and during 1918, he became an instructor at the Y. M. C. A. radio school in New York City. Later he joined the International Radio Telegraph and Telephone Company, who were making radio aeroplane material for the U. S. Government. After learning the essentials of radio manufacturing, Hiller decided to get some real operating experience.

He achieved a life long dream by shipping as a radio operator and liked it so well that he stuck to the sea till 1920.

It was in 1920 that he joined the Westinghouse Electric and Manufacturing Company in Newark, N. J., but the real radio work did not begin until he was attached to the radio staff in 1921, when preliminary experiments were begun between Newark and East Pittsburg.

OHN's first broadcasting experience occurred on the 4th of July, 1921. This was a memorable day also for boxing fans, as well as radio fans, as on that date the Dempsey-Carpentier fight was broadcast.

Bishop Says Radio Cuts Down Church Attendance

BISHOP WILSON R. STEARLY, of Newark, N. J., is quoted as saying:

"The widespread use in private houses of wireless apparatus lays a fresh responsibility upon the clergy and laity in regard to services of the church. It is debatible whether the broadcasting of sermons of popular preachers and of entire church services will act as a stimulant or a deterrent to church-going.

"Why go to your parish church when you can sit at ease in your parlor and hear the heavenly music of a capable choir and be charmed by the fervid eloquence of a magnetic preacher?

"There seems to have entered into our crowded and throbbing life another ally of those forces which make more difficult the assembling of the faithful for praise and prayer. The habit of church-going has a hard time in the face of Sunday excursions, movies sacred concerts, automobiling and broadcasting.

"Now it becomes necessary for the clergy to make the church more attractive than the world's entertainments, to discover to men the possibilities within it for strength and refreshment, and the gifts of grace in its bestowing, more precious than earthly things."

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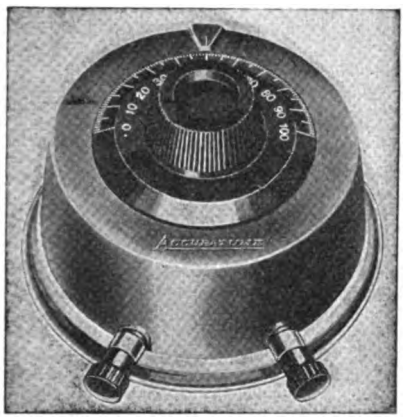

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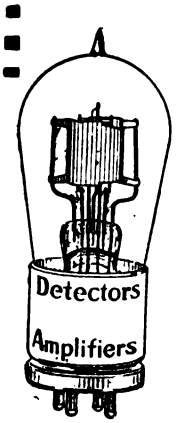

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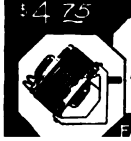

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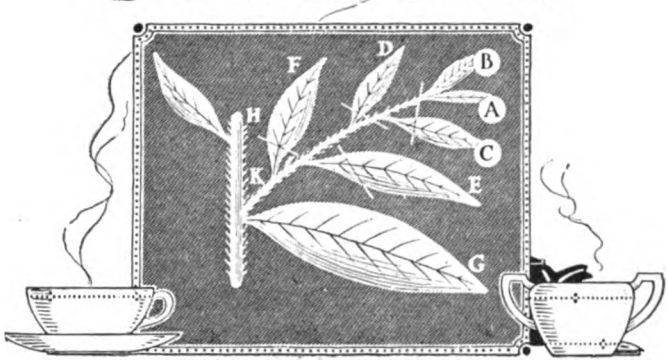

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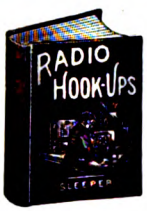

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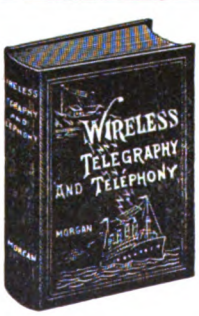

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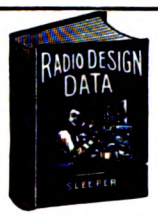

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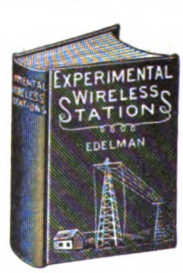

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A Portable Radio Set with "Roller Skate" Attachment

By D. L. Brown

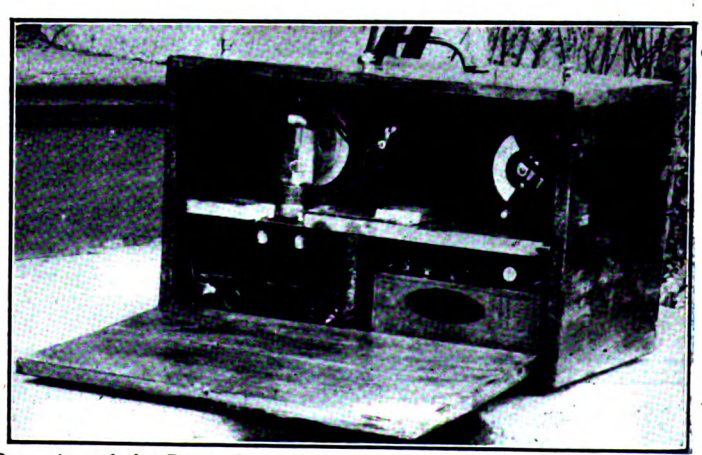
The Brown Hum Dinger DX accompanying the "Roller Skate" on a pleasure jaunt.

THE following is a non-technical description of the Brown Hum Dinger DX Portable Radio Receiver with the Roller Skate attachment. Let me say this is not intended to interest those who can afford an expensive outfit as the cost of the parts should not exceed $20.00. It is best not to tell all we've heard with this set.

As will be noted from the diagram on page 12, the hook-up is entirely novel owing to the fact that the rheostat is in series with the plate circuit thereby eliminating the necessity for all potentiometers, variometers, taps, switches, etc. The two terminals at the upper northeast and northwest corners of our suit case set may be attached to anything handy, preferably a water pipe and the ordinary antenna of the outdoor species. These are interchangeable and we have heard a human voice when there was no connection whatever. The set works remarkably well on a loop as well as the indoor attic type of antenna. However, with the regulation 150 ft. antenna 30 ft. high and a cold water pipe for a ground, the phones may be hung on the wall and the clocks down stairs regulated by the time signals heard down the stairway—that is, if one has a stairway. WJZ and WEAF come in with sufficient volume to be clearly heard in an ordinary room with one of the head set phones attached directly to a phonograph horn.

The photograph of the front elevation of the Hum Dinger clearly shows that a set of Turney phones is attached to the terminals inside the front cover which just at this moment makes a convenient writing desk. A pencil and pad are kept handy for no one knows what may happen next. A roll of No. 18 bell wire 150 ft. long can be carried together with the phones closed

(*Continued on page* 12)



Rear view of the Brown Hum Dinger showing batteries, tubes and inductances and their distribution.

McMILLAN'S ARCTIC RADIO EQUIPMENT—*(See Inside)*

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45	3- 5½	Junior	3.00	1.80
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New York Electrical Interests Form Board of Trade

The electrical interests in New York City and vicinity have organized the Electrical Board of Trade of the City of New York with Arthur Williams, of the New York Edison Company as president and Charles L. Eidlitz as chairman of the board. Mr. Eidlitz recently was appointed arbiter of the electrical contractors' and dealers' interests in New York.

The Board of Trade will act as a clearing house for credits and other information desired by the trade. Membership will be held by representatives of the lighting companies, telephone and telegraph companies, manufacturers, jobbers, contractors, distributers, dealers and the electrical press within 25 miles of the City Hall. The purposes of the organization are: "To promote generally the interests of the electrical industry; to deal with problems concerning or affecting the industry; to represent the industry in public affairs or legislative matters affecting the industry; to be the central organization and headquarters for the entire electrical industry of the City of New York and territory; to promote the growth of the industry through the coordination of effort in the rendering of more extensive service to the public, based on the conviction that the most efficient service will elevate the industry to a plane that its usefulness deserves."

The Electrical Board of Trade shall not, however, it is stated, in any way deal with prices, "nor shall it foster combinations or agreements in restraint of trade."

The organization will be controlled by a Board of Governors consisting of three representatives elected from each branch of the industry, and will number 36 men, representing 3,000 firms, corporations and individuals.

The officers elected besides Mr. Williams and Mr. Eidlitz, are: Vice Presidents, Walter J. Drury, Western Electric Company; William C. Peet, Peet & Powers Company; Theodore Beran, General Electric Company; Treasurer, John P. Ryan, Cleveland & Ryan, and Secretary, John MacIntyre.

From Cavite to Washington Direct

WIRELESS message from the Naval station at Cavite, P. I., addressed to San Francisco for relay to Washington was picked up in the Washington Radio Central recently and copied before the San Francisco operator indicated its receipt. Needless to say, it was not relayed to Washington. This message was copied without error over 11,500 miles of sea and land.

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 12. Whole No. 64 June 16, 1923 15c. per copy, $6.00 a year

Radio Equipment of Capt. MacMillan's Arctic Vessel "Bowdoin"

By Sheldon Fairbanks

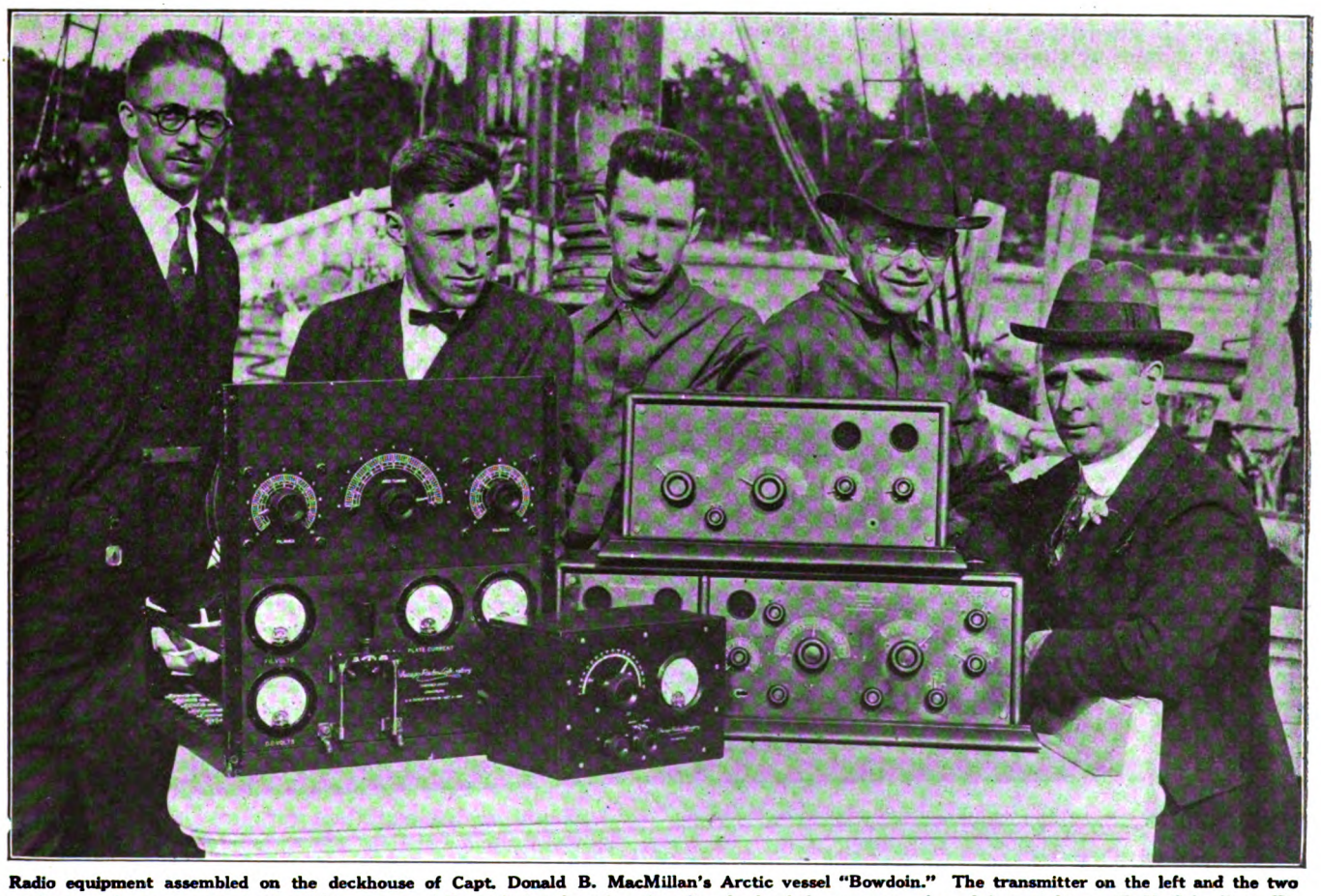
A Member of the Expedition

IN equipping Captain Donald B. MacMillan's polar ship "Bowdoin" with radio apparatus for its trip to the Far North on June 23 several interesting problems presented themselves.

The design and installation of the receiving and sending apparatus had to be of such a nature as to overcome the extreme temperatures to be encountered in the Arctic; also the schooner carries sails, and the rigging of the antennae presented some difficulty.

However, M. B. West, chief of the Chicago Radio Laboratory, who did the work, is confident that, for the first time, communication to and from the polar regions from the United States will be possible. This belief also is shared by the ship's operator, Donald Mix, and by K. B. Warner, secretary, and F. H. Schnell, traffic manager, of the American Radio Relay League, who have inspected the installation.

In the apparatus itself every precaution has been taken to permit of the expansion and contraction of the various parts to allow for extremes of temperature without interference with normal operation.



Radio equipment assembled on the deckhouse of Capt. Donald B. MacMillan's Arctic vessel "Bowdoin." The transmitter on the left and the two receivers and wave meter at the right were specially built for the trip. Standing back of the apparatus from left to right are F. H. Schnell, traffic manager, A. R. R. L.; Donald Mix, radio operator on the "Bowdoin"; K. B. Warner, secretary, A. R. R. L.; M. B. West, chief engineer of Chicago Radio Laboratory, in charge of installation, and Capt. Donald B. MacMillan, the well-known Arctic explorer.

(Continued on next page)

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How to Get Results Out of Your Receiver

By O. I. See

WHEN you get it home, take a screwdriver, a pair of pliers and a hammer and see if all the connections are firmly soldered. To do this, first take the screwdriver and pry under each connection. If it sticks, take the hammer and hit it a swat. If it still remains connected try to twist it with the pliers. If all the connections withstand this test, you may be assured that they were soldered.

Next be sure to try your bulb by shaking it violently to see if it is solidly constructed. Bite the tip off under water and test the vacuum. If the tube fills up and there is no air bubble in the tube there was a good vacuum in it.

Make sure that your condensers are not shorted. If one of the plates seems to be too close to another, take your hammer and proceed to straighten it. In order to prevent bending the plate next to it, take a wedge, and shove it between the bent one and the straight one and hit it a good, healthy blow. Be sure to test the bearings and take all the plates apart to dust them and then put them back being sure that you leave out two or three of the washers so that you will always have a couple on hand if you lose any.

Try out all the wires on your variometers and variocouplers. There is sometimes a loose wire. In order to test them grab each wire with a pair of pliers and give it a yank. If it doesn't stretch or break you may be assured that it is tight.

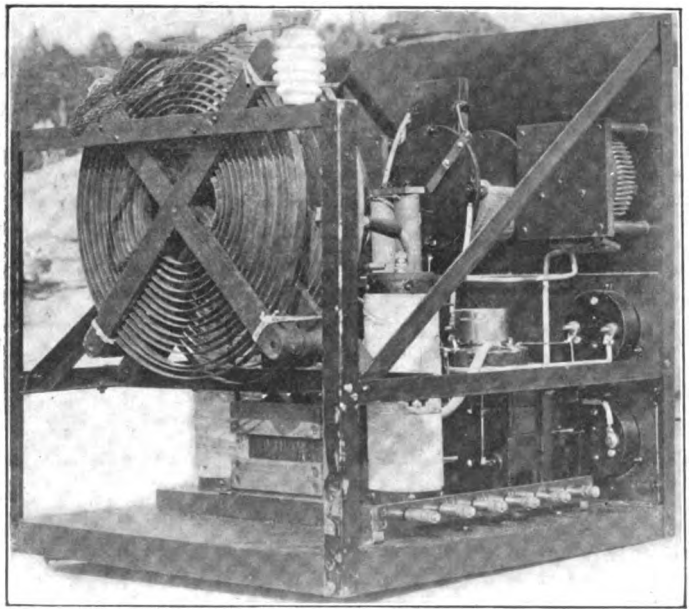
If you are using a storage battery it is always a good plan to let it stand a long while without water. This improves the plates as the acid gets stronger because of the water evaporating. It is also a good test of a battery to short circuit it with heavy wire. If the plates stand a good, long short circuit without buckling it was a good battery. There are very few batteries that will stand this test, so if yours doesn't, you may be sure that it is only average, and it is better to throw it away and get a new one.

What is a "Safety Gap?"

By a safety gap we mean a small air gap, generally put across the antenna and ground connection of a receiving set to allow any heavy electrical charge that gathers on the aerial to discharge without damaging the receiving set. The safety gap in common use generally consists of a minute spark gap, with the terminals about 1/50 of an inch apart. This small gap will not protect the set against lightning, but is used where there is a transmitter set nearby, and can be found on most all commercial sets.

(*Concluded from preceding page*)

The antenna is rigged to the two masts, with all four wires leading on a slant forward of the foremast, the lead-in wire being taken off one end of a small spreader swung about half-way between the top of the foremast and the tip of the bowsprit.



Rear view of the specially designed and built transmitter with which the "Bowdoin" will keep in touch with civilization during her trip to the Far North. It is straight C. W. with a wave length of 200 to 600 meters.

The lead-in insulator presented a peculiar problem, as with an interior temperature of 70 degrees above and a temperature outside of 70 degrees below a difference of 140 degrees is encountered. The slightest metallic connection between exterior and interior under such a great difference in temperature conducts the heat so rapidly that it is almost impossible to prevent ice collecting on the inner end of the conductor. Therefore the insulator itself was constructed of three concentric tubes surrounding a long, slender brass rod. The outer tube is of specially treated wood; the next is of hard rubber, and the inner tube is of glass.

Because of the obvious necessity of fuel economy the power for the transmitter is decidedly limited. The power plant consists of duplicate 850-watt Delco gas-engine-driven generators, connected to a 160-ampere-hour, 32-volt storage battery. This battery must carry the regular ship's light load in addition to that of the radio transmitter, which alone requires 50 amperes at 32 volts. Consequently one of the gas-engine-driven generators must always be kept in operation while the radio transmitter is working.

The failure of the 32-volt battery would mean a complete breakdown of the radio transmitter. In consequence this equipment was selected with great care, and a very complete set of spare parts, chemicals, etc., has been provided.

The small B batteries, so necessary as a part of the receiving equipment, also presented a problem. These small batteries seldom have a life of more than one year, and the expedition will be gone longer than that; possibly, with unfavorable conditions, two or three years.

Therefore the manufacturer provided a large supply of especially selected cells, whose behavior during manufacture was carefully watched so as to insure the longest possible life. These were selected by observing thousands of the cells during the regular course of manufacture and selecting only those which had characteristics indicating the longest possible life.

In addition to providing B batteries for a period of time longer than the possible life of the best selected cells a complete set of parts, with the necessary chemicals, are provided, with minute instructions so that additional batteries can be manufactured aboard as needed.

Every possible precaution has been taken to insure against failure from any preventable cause.

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A Portable Single Tube Loop Receiver That Is Cheap and Reliable

By Robert L. Dougherty

THE ideal portable receiver for all practical purposes is the one or two tube reflex set, but there is the drawback of the additional expense of the transformers and their added weight, which, when considered in terms of pounds per hiking mile, grow heavier with each step. With this idea in mind it was thought possible to contrive some means of using a single tube on a loop without the necessity of relying upon reflex reception for medium distance.

Of course, it must be realized that a single-tube receiver of the type described here will not bring in stations 1,800 miles away, as do the single-tube, single-circuit sets using antennae and ground. But if reception over medium distance of, say, 50 to 200 miles is desired this circuit will give complete satisfaction if care is taken in its construction and operation.

In this circuit there is a decided change from most loop circuits, as a tuner is used. The tuner should be specially wound, and should be made in the following manner: Procure a tube 3½ inches in diameter and 5 long. If a cardboard tube is to be used it is best to thoroughly impregnate it with paraffine or beeswax to prevent shrinkage and consequent loosening of the wire. On this tube are wound the two coils, L-1 and L-2, as shown in the diagram herewith. L-1 is 32 turns of No. 22 DCC wire, tapped every four turns, making eight taps in all. L-2 is 12 turns of the same size wire, wound ¼-inch away from the first winding, and tapped at the eighth and last turn. Care should be taken to see that the two coils are wound in the same direction. In the winding of these two coils do not make the mistake of shellacing them to make them hold. If you want to be sure that the turns will not slip put a strip of adhesive tape along the tube, and when the wire is wound on top, the tape will groove and prevent any slipping of the wire.

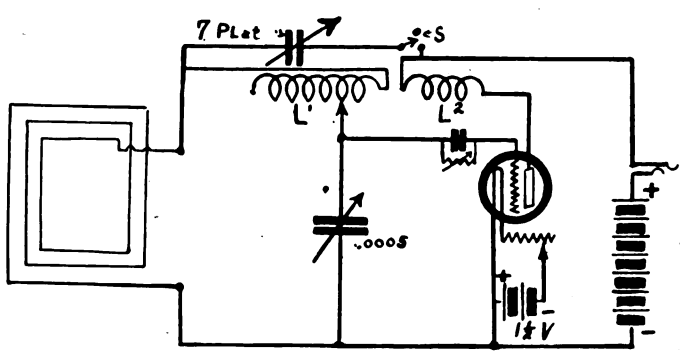
The seven-plate condenser is connected between the grid side of the loop and the switch S. This condenser is necessary to provide additional feed back when regeneration is found hard to promote with the plate coil. On local work this condenser will be found a great help in fine tuning, and on longer distance work will greatly increase the volume after the set is tuned in, although re-tuning may be necessary.

The variable condenser across the loop should be as shown in the diagram—one of .0005 mfd. capacity. It is not necessary that this be of vernier control, but, as with all single-tube circuits, it will help considerably in the tuning of the set. If it is not thought advisable to go to the added expense of purchasing one the simple button-dial control will suffice. The rest of the apparatus used is the same as in any set, and needs no explanation. As with any set that you construct you should only buy and use the best apparatus, and the wiring should be carefully insulated and soldered, particularly in a portable set, where it is subjected to the jars and jolts of handling and there is much more chance of breaking connections than in a regular table set.

The grid condenser should be .00025 with a variable grid leak. This is specified because of the fact that, if the dry-cell tube is used, it is generally very critical as to the leak value and much better operation can be obtained with one of the variable type.

When the set is assembled and you are ready for reception the loop is swung in the direction of the station desired, the tube turned on and the switch S placed on the open point. Then the condenser across the loop is turned until the station desired is heard. The switch for coil L-1 should be placed at about the middle tap, and the switch for L-2 is placed on the first or eighth turn. Then the condenser is again adjusted, this time also tuning with the coil L-1, and condenser switch S is placed in the circuit. Then the set is re-tuned as to the loop condenser. The entire tuning after this is done with the loop and the two condensers. If longer wave reception is desired, such as the 492 or 509 stations, the two coils are tuned up higher, using more inductance, and the same method of tuning is pursued. It will be found that, with some stations, better reception will be had by keeping the switch S on the open point.

The set can easily and neatly be mounted in a small case, such as is used for portable typewriters, and the controls neatly mounted on the outside of the box. In this way all the batteries can be mounted inside the cabinet, and with a portable loop such as described in the Vacation Number of



Schematic diagram of a convenient and easily made loop receiver that you can readily pack in one corner of your trunk and take away with you. The two coils L1 and L2 should be wound as specified in the accompanying text.

RADIO WORLD by Mr. Gordon a neat, compact and flexible loop receiver can be taken away with you on your vacation.

Care should be taken when mounting the tube to see that it is shielded from moving parts, otherwise you will arrive at your destination minus a tube and a good part of your temper. The current to run the set can well be furnished by a single dry cell for the filament and one of the small block-type B batteries for plate current, which will furnish enough current to operate the set over a period of two or three weeks if it is used three hours per day.

A good point about the receiver described is that, if an antenna and ground are available, they can be easily attached by simply using them in place of the loop, and, while the set is not designed for use with antenna and ground, good results can be had by their use, as it will then function as a single-circuit receiver.

With this receiver, as with any other, of course, the final results depend upon the operator knowing his set and how to work it. There can be no hard and fast rules for the operation of any set. No matter how definite the instructions are they cannot cover all the points that will be necessary when you are tuning in. The best way to operate a set is just like running a car, which is to practice until you can do it without thinking about it, and then it becomes automatic.

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The Navy's Radio Central at Washington

By Carl H. Butman

THE new radio central office of the Naval Communication Service in Washington, D. C., is located in the big Naval Building at 19th and B Sts., near the Lincoln Memorial—sixth wing, second floor, rear, to be exact, and is approached through the several offices of the Communication Service, one of which is that of Rear Admiral Ziegemeier.

From this office issue all Naval radio messages from the Capital. The transmitters at Arlington, Annapolis, Sayville, and several smaller stations are controlled directly from keys installed here. Annapolis and Sayville are high-powered, trans-continental and trans-oceanic stations; and Arlington, which is a link in the long coastal chain, is used for medium district communication with Norfolk, Charleston, Key West, New Orleans and Guantanamo and ships at sea, over spark, arc and tube sets.

(C. International Newsreel)

Taking the romance out of radio by making it resemble a land telephone. The Radio Central control room in the Navy Department Building at Washington, D. C., where the channel lines of all the large transmitters of the United States are controlled. Chief Gunner J. J. Delany is at the board plugging in on the trunk lines which connect him with stations many miles away.

Long distance reception from the many outlying stations of the Naval chain is secured through six big receiving sets, known as RB type tube receivers, located in six separate rooms in different sections on the third floor of the Naval Building. From these sets leads run to the central switchboard and as many operating desks in the central office. The RB receivers pick up the messages on eight foot loops installed directly overhead on the roof of the building. These coils are directional and may be rotated from the rooms below by a rod when tuning in. Each set is put in operation, watched and shut down by a monitor engineer who makes continual rounds of the six separate rooms. A continuous watch is kept on these large sets, each covering a special station. One listens in on San Diego on 9,800 meters; another for San Francisco on 10,500; a third on San Juan on 8,785; a fourth for Balboa on 7,000; number five on French stations on 15,000 and number six is used for emergency, and experimental work and ships. Each inside wire leads from the switchboard to the operator's desk, where phones, typewriters and transmitting keys are installed.

The efforts of the Naval Communication Service are for reliability and efficiency in handling messages, and the sets and operators work on certain circuits all the time.

Two shorter wave sets, of SE 1420C-type, are installed in the central office, being connected with aerials on the roof above. These sets are used for receiving neighboring stations and ships on the Atlantic.

In Radio Central a busy scene confronts a visitor; some keys are clicking and some of the operators are typing messages from distant stations. Messengers come and go with dispatches from government officials to our representatives in foreign countries and our ships in the seven seas.

The long land line formerly used between the old receiving station at Bar Harbor and the Washington Office has been discontinued at large annual saving. Bar Harbor is now a coastal and compass station and handles no long distance messages, although the equipment is left in place in the event of emergencies or war requirements. Washington is literally the Naval Radio Central for the country today.

Radio and the Woman

By Crystal D. Tector

FRIEND HUSBAND told me the other day that he was going on a two weeks' fishing trip, and wanted to know if I would go along. I told him that I was perfectly satisfied to stay at home and buy my fish at the store, but that he could send me a couple of young trout to start a hatchery, so that next year he could go out in the backyard and catch all the fish he wanted. He laughed, and started in to pack his things, and then asked me if I minded if he took along my "pet Flewelling." Well, that was nerve if there ever was. Bad enough that I have to be a widow for two weeks without his taking the apple of my eye with him and leaving me all alone. I told him to get his own set out of the car and take that, but he said that he thought that mine was lighter and better. "You know I have to cross the lake in a canoe, and I don't want to take a chance of losing it." Oh, didn't I give it to him! Girls, I am going to start a club and propose that every woman build or get her own set, and never let hubby or his friends even listen to it or use it.

A school chum of mine whom I haven't seen in years dropped in the other day, and of course we started in to talk over old times and to recall all the old incidents of high-school days. After tea we went in to our "radio room," and she quite pleasantly remarked that she was taking the radio and advanced physics course at Barnard College. Well, you could have knocked me over with a half of a feather. "Why, G....., you used to hate elementary physics and math. and all those things." "I know that, K....., but you see I married a dear boy who is just up to his shoulders in radio research work, and I am studying it so that I can help him or work with him." Well, that goes to show that it is not only the men who can show how the wheels of progress turn and what makes a signal audible in the loud-speaker. I think that I will get hubby to let me take it up when I am not busy with other things. Then maybe I can write a book and become famous.

* * *

Isn't our new list of broadcasting stations just the thing?

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Tips on Loading Circuits for the Higher Wave Lengths

EVER since the new allocation of wave lengths a great howl has gone up from amateurs who have bought or built sets that will not reach the new higher wave lengths on which broadcasting is done. Quite a few have seriously considered junking their sets which have done such wonderful work for them in the past few months, and of course hate to do it, yet cannot think of any way in which to overcome the disadvantage under which they are working.

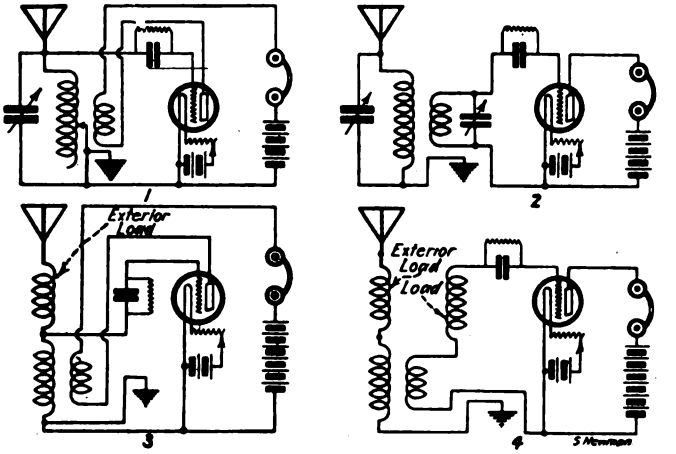
There is a very simple manner in which all of this can be overcome. It will also give the owners of such sets an insight into just what their sets really can accomplish.

No matter what type of set it is, it can be loaded up to meet the wave length of any transmitter, whether it be 492, or 12,000. Of course on the single circuit sets this is rather a difficult thing to do; that is, if you are considering loading it up to the real long wave lengths. But if you want to cover the broadcasters, and a little bit more besides, you can do it so easily that you will laugh at yourself for ever thinking that you were going to junk the set.

The first and simplest method of meeting the new wave lengths and one that is necessarily limited is to use capacity shunted across the main inductance of your set. By using a 43 plate condenser in parallel with your set, you can fully meet the new waves and yet you won't have to drill a single hole in your panel because all you have to do is hook a condenser across the antenna and ground posts of your set. Simple, isn't it?

If your set is a double circuit affair, it will be slightly harder, as both circuits have to be loaded. This can be done, however, by the same method—simply shunt your condensers across the inductances in both the primary and secondary.

The next, and probably the most efficient method, is to load the circuit by means of extra inductance. If you are handy and want to save money, wind a coil about four inches in diameter and six to eight inches long with a layer of No. 22 SSC wire, and tap it off every 20 turns for the first 100, and then every 40 turns after that to the end. That is a loading coil. Probably the most efficient of all, however, is the DL or honeycomb coil. In that case, it will only be necessary to insert an adapter in the antenna lead, and stick the coils in them. If it is a single circuit tuner, it will, of course, only be necessary to use one adapter. By this means you can get any desired wave, up to 20,000 by simply using the proper coils. If it is a double circuit tuner, it will be necessary to load the primary as well as the secondary, and if it is a triple circuit affair using a tickler and you want to go up beyond a reasonable amount (800-1000 meters) it would be best to load all the circuits.



Figs. 1-4. Various methods of loading both single and double circuits for higher wave lengths as explained in the accompanying text.

The accompanying diagrams show the four methods of loading the single and double circuit sets, both by means of capacity and by means of external loads which are the approved methods. The capacity method is only good for a very limited band, and a tuner that normally tunes to 400, when shunted by a 43 plate condenser will reach to about 700 efficiently. It is therefore seen that the best method is to load by inductance.

Radio Is Not a Summer Luxury—It's a Necessity!

DO you appreciate the value of your radio set as a summer necessity? If you don't you should, because it is just as much good in the summer as it is in the winter. The mere fact that the distance over which you can receive and the transmitters can send is shortened in a degree is of minor importance.

The main thing of importance is that you should and will use radio this summer. Of course, you may not like to take your three or five tube set away with you, but why let a little thing like that stop you? With 600 odd broadcasters working every minute of the day and night, you ought to be satisfied to take a single bulb set, or even a crystal detector set away with you, and get programs that should satisfy even the most critical.

The thing of main importance is that the set you take be portable and at the same time sensitive enough to get something worth while. Well, you have been trying out single circuit sets all winter—now put one of them into a small cabinet, incorporate a dry cell bulb, furnish the current from three or four flashlight dry cells hooked in parallel, with a small bloc type B battery, a good pair of phones, some wire for an antenna, and no matter where you go, you can keep in touch with the world through radio.

One of the main factors that has made summer radio possible is the small current dry cell tube. Heretofore it was necessary to have a storage battery or its equivalent to supply the filament. Now that is rendered unnecessary, because a small cell is all that is needed to supply such a tube for many hours.

When starting away, of course, one of the points to be considered is the antenna. You may be going camping, and if such is the case, just throw a stone with a string over a branch and pull up your insulated wire. Then when you decide to move all you have to do is take it down and roll it up. If you are going automobiling arrange your set in the back, on or under the dash, or along the running board. When you stop your car attach the wire to your set, and perform the same rites in installing your antenna as before.

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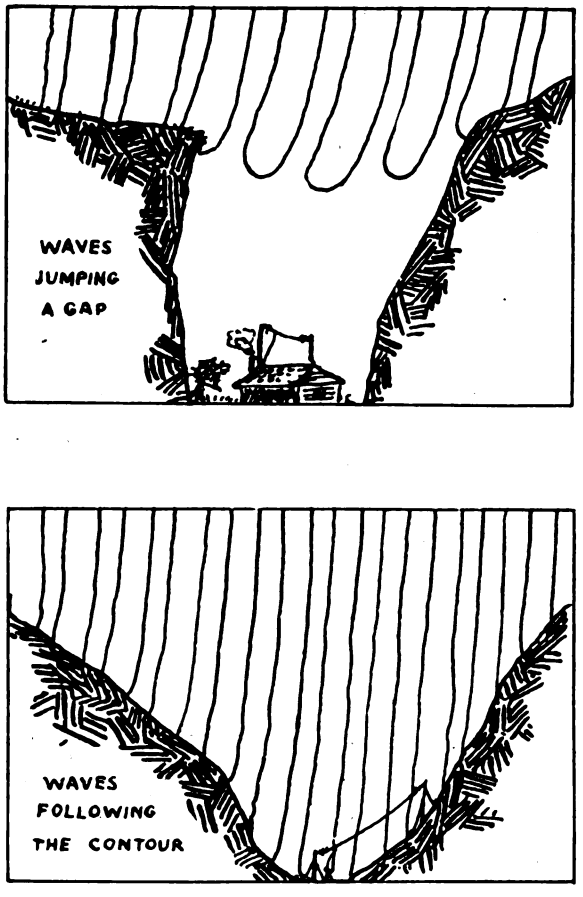
Conditions that Affect the Range of a Radio Receiver

By Kenneth Malcolm, A. I. R. E.

EVER since radio has come into popular use the universal questions seem to be "How far can my set receive?" and "How far can such and such a station transmit?" If a fixed and ideal set of conditions were available, the answer could be given with a fair degree of accuracy, at least theoretically, but practically there can be no definite answer because of so many variable factors that must be taken into consideration. There may be found cases in which two identical sets, with antenna in exact copy, located but a block apart, have given widely different results—one getting the most distant DX stations and the other getting nothing but the locals. The difference lay in the immediate environment.



Showing how radio waves will follow the topography of the country, but will jump sharp gaps between high walled places.

As an illustration of what is meant by variable factors, let us ask how far a locomotive whistle can be heard. Immediately the answer might occur "It depends upon the power of the whistle." Yes, that is true, but it also depends upon the nature of the surrounding country, the condition of the air, the direction of the wind, the direction the train is travelling, and the sensitiveness of the ear of the listener. In wide open country the sound could be heard much farther than in thickly wooded country or in the city. It could be heard farther if the air was clear and the wind blew in the direction of the listener; also farther if the listener's ears were very sensitive and the locomotive was approaching instead of going in the opposite direction. Any combination of these factors would produce different results.

In radio work we have even more factors to contend with. First of all comes the power of the transmitter and the sensitiveness of the receiver. Under given conditions an increase of power or an increase in the sensitiveness of the receiving set will give a proportional increase in range. A broadcasting station may have a maximum range of 1,500 miles; but this distance is covered only with a two stage radio frequency amplifier set at the receiving end. A single tube set might only hear it 200 miles and a crystal set only 30 miles. Then again, the reverse is also true; a single tube set might be rated at 500 miles, but only from a station with one kilowatt rating. A 500 watt station might only be heard one-half that distance.

Next in importance comes the immediate environment—possibly this comes even before power and sensitiveness. An aerial situated between tall, steel frame structures will not bring in as good results as one that is located in the open, for the grounded steel frames absorb a large part of the energy before the waves reach it. It is also manifest that steel buildings affect the quality and range of the waves from a transmitting station. A station that promised to be one of the best in the city had to be dismantled, or at least used only for experimenal purposes, because the steel in the building in which it was located and in neighboring buildings, had the tendency to distort the waves thereby preventng faithful transmission.

A curious case was reported quite recently by the army. A fine transmitter had been erected on a mountain after much hard work. They were able to radiate a good 2 kilowatts, but try as they might they could not reach their home station but fifty miles away. After much reasoning and an extended search they found that an iron mine in the vicinity was the cause of the trouble. It simply drained all the radiated energy into the earth.

Radio waves will pass much more readily over water than over land, the degree depending to some extent on relative dryness of the land. Then, too, there are fewer obstacles in the way when the waves pass over water. Ships at sea copy "press" many times over a distance of 1,500 miles with a comparatively ancient crystal set.

The condition of the atmosphere is a great factor that cannot be disregarded, for this is the operator who can at will switch you to either "local" or "long distance." It was the atmospheric conditions that enabled most of the long distance records to be made and broken. When you can get Davenport one night and only Pittsburgh the next night, you can in most cases blame it on the weather. Clear air is the best air; and water and dust particles are detrimental as they tend to absorb part of the energy of the advancing waves. Reception cannot be carried on as well in the day time as in the night because the sun's rays ionize the air particles and render them conductive, hence absorbent.

Considering all the variable factors it is not quite

(*Continued on next page*)

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A Radio Set Personifying Portability

By Harvey Graham

WITH every amateur striving for portability and convenience in radio sets to take away for the summer it is not surprising that some very fine examples have been evolved. As far as portability goes that is very easy; but, for fine workmanship and novel arrangement, a portable set made by C. A. Pezet, of 46 West 65th Street, New York City, is the neatest and most compact yet seen.

With this set, the circuit and picture of which is shown herewith, several outstanding features at once make themselves apparent. One is that the set will operate without any antenna. It has been demonstrated, and exceptionally clear reception recorded, using the center post (No. 3) with a ground, such as a wire in a small lake, or even hooked to a telephone, or clipped on the foliage of a tree. The circuit

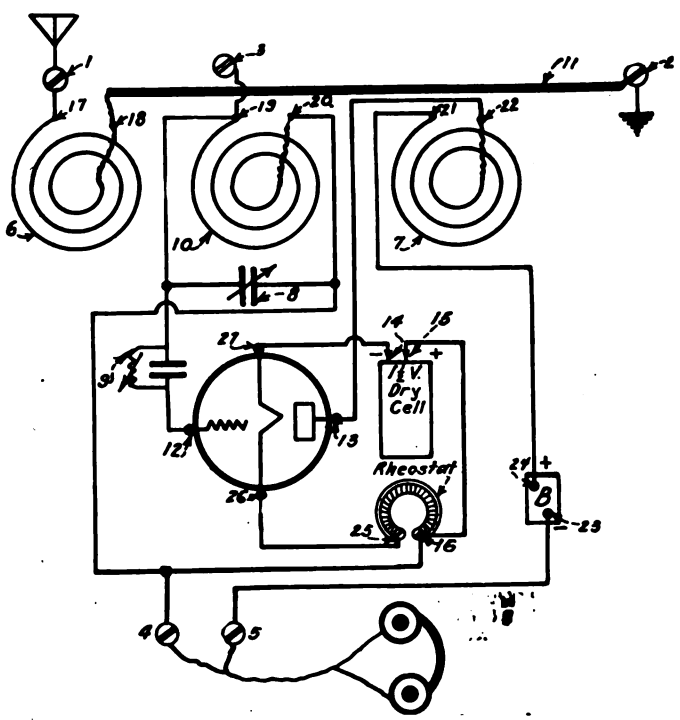

Diagram of the Pezet set using the specially made spiderweb coils which make its use without antenna possible.

has so many adaptabilities that it is possible to take it any place at all. You can use your bed-spring, or the frame of the car, or just drive a wire into the ground. It can also be operated at a regular three-circuit set with antenna and ground. When antenna is not employed the primary circuit is not used, and simply acts as a stabilizer and vernier tuner. Thus exceptional sharp tuning and selectivity is possible.

The secret of the whole set lies in the special spiderweb coils, wound with litz wire on a special former. The originator of the circuit spent many months before he finally determined the correct amount of inductance to be placed on each before it would work satisfactorily.

As can be seen in the drawing, the set, when used with antenna and ground, is an ordinary three-circuit spiderweb tuner, the tuning being accomplished by means of varying the coupling of the tickler and primary. It is when the third post (3) is used that the special advantage of this circuit is brought forth. When this is done it is seen that the ground connection is made to one side of the spiderweb that goes to the grid condenser and grid leak. Then, of course, the primary is of no use, the entire tuning being accomplished with the condenser across the secondary and the coupling of the tickler. The tuning is remarkably sharp and wonderfully clear reception is had, free from all distortion and noise. If interference is noticed tuning is done

The portable set being used by simply attaching a wire from the center post to the foliage of a convenient bush.

with the primary, and it stops, having been fully absorbed.

This entire set can be easily accommodated in a Corona typewriter cabinet or carrying case, as shown in the accompanying illustration, and because of the fact that a variable condenser of the book type is used the set can be accommodated, batteries and all, and there is enough space for two sets of phones and a spare box for odd parts, such as screws and clips. Enough wire can be carried on a small spool to form a convenient antenna should it be so desired.

When considering the work that this little set will accomplish and the small space it takes up, as well as its additional feature of not even needing an aerial for efficient operation, it can be claimed that the "essence of portability" has been reached.

(*Continued from preceding page*)

fair to ask how far a certain set can receive. The only real way to find out is to try it under the actual conditions in which it will be eventually used. Even then, you will find that every set has what we might call a reliable and variable range; one that can be depended upon under all conditions, and a second that will work only when things are most favorable.

By reviewing the points mentioned, it may be inferred that a given receiving set will have its greatest range when the air is clear, at night, over water, and the transmitter is of the highest power and in the most favorable local environment. To the degree in which this perfect state of affairs is an actuality, will the goal of maximum possible range for a specific set be heard satisfactorily.

If your set does not give quite as satisfactory results as you might expect, don't condemn it immediately but look around and see if there is not some condition which you might better. Possibly a little change in the location of your aerial might transform a failure into a success. When on the hike keep to the water, the open spaces, and the mountain tops and stay out of the walled-in valleys.

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More New Broadcasters Assigned Wave Lengths

WASHINGTON, D. C.—Five new Class A stations were licensed during the ten days ending May 31, three Class C stations transferred to Class B status and 28 Class C stations transferred to Class A with specific district wave lengths. Class B stations now number 39; Class A, 146; Class C, 405, and Class D, broadcasting experimental, 1; a total of 591 stations.

Five New A Stations Licensed

Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
WABI	Bangor Railway & Elect. Co., Bangor, Maine	1,250	240	50
WCBA	Haimbach, Chas W., Allentown, Pa.	1,070	280	5
KFIO	North Central High School, Spokane, Wash.	1,190	252	50
WABJ	Radio Laboratories, The, Dean Bldg., South Bend., Ind.	1,250	240	10
KFIK	Gladbrook Electric Co., Gladbrook, Ia.	1,280	234	20

Twenty-eight Transferred from Class C to Class A

KFAV	Abbot Kinney Co., Venice, Calif.	1,160	258	5
WGAW	Albright, Ernest C., Altoona, Pa.	1,150	261	100
WOAG	Apollo Theatre, Belvidere, Ill.	1,340	224	20
WLAS	Central Radio Supply Co., Hutchinson, Kansas	1,230	244	20
WBU	City of Chicago, Chicago, Ill.	1,050	286	500
KFAT	Donohue, Dr. J. T., Eugene, Ore.	1,090	275	50
WPAJ	Doolittle Radio Corp., New Haven, Conn.	1,120	268	10
WDAK	Hartford Courant, Hartford, Conn.	1,150	261	100
KFAU	Independent School Dist. of Boise City, Boise, Idaho	1,110	270	10
WSL	J. & M. Elect. Co., Utica, N. Y.	1,100	273	100
WCAY	Kesselman O'Driscoll Music House, Milwaukee, Wisc.	1,150	261	500
WGAL	Lancaster Elect. Supply & Const. Co., Lancaster, Pa.	1,210	248	10
WKAX	Macfarlane, W. A., Bridgeport, Conn.	1,300	231	15
KFEV	Radio Elect. Shop, Douglas, Wyo.	1,140	263	100
KDYM	Savoy Theatre, San Diego, Calif.	1,190	252	100
KFHR	Star Elect. & Radio Co., Seattle.	1,110	270	100
WKAC	Star Publishing Co., Lincoln, Nebr.	1,090	275	100
WBL	T. & H. Radio Co., Anthony, Kansas	1,150	261	100
WRW	Tarrytown Radio Research Lab., Tarrytown, N. Y.	1,100	273	50
WRAR	Thomas, Jacob Carl, David City, Neb.	1,330	226	20
WIAF	DeCortin, Gustav A., 10 Marlborough Gate, New Orleans, La.	1,280	234	10
WTAW	Agriculture & Mech. College, College Station, Texas	1,180	254	50
WMAC	Page, J. Edw., Cazenovia, N. Y.	1,150	261	200
KFDC	Radio Supply Co., Spokane, Wash.	1,060	283	10
WQAW	Catholic Univ. of America, Washington, D. C.	1,270	236	50
WBAW	Marietta College, Marietta, Ohio.	1,220	246	100
WSAH	Leonard, A. G., Jr., Chicago, Ill.	1,210	248	500
KFDU	Nebraska Radio & El. Co., Lincoln, Neb.	1,250	240	20

Three Class C Stations Transferred to Class B

WBAV	Erner & Hopkins Co., Columbus, O.	770	390	500
WOAI	Southern Equipment Co., San Antonio, Texas	780	385	500
WOAW	Woodmen of the World, Omaha, Neb.	570	526	500

Radio Amateurs of Great Value in War

THERE is practically no end to the possibilities of radio for military use, an officer of the Signal Corps stated recently, adding that young men who wish to serve their country can do so in no better way than to become qualified in radio and to join the National Guard or Signal Reserve Corps of the Army.

There is no more interesting study for young Americans, he points out, than radio. It need not be taken up as a profession, but merely as a part of one's general education. Every one should become familiar with radio in "this electrical age," the officer insists, explaining that some of our leading radio engineers like "Eddie" Armstrong, started as amateurs.

As an instance of the work of former amateurs who served in the Signal Corps during the war, it is said that 73 per cent of the 400 radio men engaged in intelligence work were ex-amateurs. Not a single "leak" occurred in the service, which intercepted 73,000 enemy messages and recorded 175,000 bearings on enemy radio stations. The country and the Signal Corps is greatly indebted to these amateurs for their war work.

Although little is known of the work of the radio intelligence section of the Army during or since the war, it was one of the most spectacular. Radio direction finders were placed all along the lines, at a distance of about five miles from the actual front and spaced about twelve miles apart. These receiving sets located the enemy stations in operation, recorded their bearings by means of directional coils, not unlike modern radio compasses, and forwarded the bearings to headquarters where they were plotted on maps. The reports from many American radio observers enabled the staff to keep an accurate check on practically all the German stations all the time.

Other radio receiving stations at Army Headquarters intercepted and copied all enemy code messages and telegraphed them back to General Headquarters where code experts worked them out, giving the staff valuable information as to the movements or intentions of the enemy.

On one occasion, when the Germans were planning a big offensive, the code all along the line was suddenly changed. The old code, known by the Americans for some time, became valueless. But one German officer could not decipher a long message sent him in the new code and asked his commander to repeat it in the old one. This was done and as the American intercepting stations copied both messages, the staff of experts at headquarters soon had a fair solution of the new code, which they eventually worked out in its entirety. The repetition of the message in both codes was more than they hoped for, and when the new code was transmitted to the French and British headquarters, the American radio intelligence service was credited with a big "scoop."

Many times, it is reported, enemy messages were intercepted, decoded and rushed to the troops at a threatened front in time for them to prepare for the projected attack.

Wonderful results were also accomplished by our advance listening-in stations in front line dugouts and trenches, where amplifiers with wires radiating to grounds in no-man's land were placed. Sometimes they were actually tied in on enemy phone lines. These stations picked up enemy phone conversations by induction, enabling our operators to copy orders and messages.

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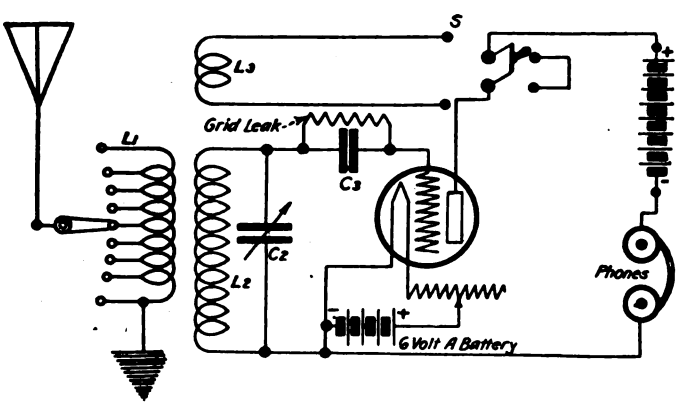
RADIO PRIMER

For the New Army of Radio Beginners

By Lynn Brooks

REGENERATION: In order to understand regeneration it is first necessary to have a knowledge of how the ordinary vacuum tube works in the reception of signals. In the regular two-circuit tube set the energy is picked up by the primary circuit, consisting of antennae, primary coil and ground. Due to the proximity of the secondary coil there is a current induced in the secondary or grid circuit. Immediately there is a large variation of the current in the plate circuit, due to the fact that the grid, being charged positively, allows the negative electrons to flow to the plate. This circuit is supplied by the high voltage battery, and consists of the phones, high voltage battery and plate of the tube, and the filament of the tube, which is connected through the circuit from the minus of the high voltage battery. At the second when the grid is charged the current flow in the high voltage battery circuit (commonly called B circuit) is at its peak, and an exact reproduction of the signal emanated is heard in the phones. The strength of this current flow can be controlled in a small way by the heat of the filament. Up to a certain point (called the "saturation point") the filament throws off electrons in direct proportion to the amount of current flowing through it. After this saturation point is passed it will not throw off any more than a certain amount, and frequently the electron flow jams and ceases. These electrons, being negative in action, allow the current to flow in the plate circuit when the grid is positively charged.

Now if we introduce a coil in the plate circuit and couple it to the secondary or grid coil we can get what we call regeneration. A signal is impressed on the grid in the manner mentioned, and a variation of the current in the plate circuit takes place. The extra coil being in the plate circuit, whatever current flows in the plate circuit must of necessity flow through the coil. This coil is held in inductive relation to the grid or secondary coil. It is evident, therefore, that there will be a transference of energy from the plate coil to the secondary or grid circuit which will tend to back up or reinforce the original current in this circuit, causing a much greater amount of current to flow in the plate circuit than originally. This action occurs many times until the point is reached at which the tube oscillates itself, at which time the original signal tone is lost and a mushy note takes its place in the tube. In controlling regeneration the amount of coupling used between the plate coil (tickler) and the grid coil (secondary) are the controlling features in the amount of regeneration or feed back, and the best point in this self-amplification scheme is the point at which the tube is doing its utmost just below the oscillation point, at which it "spills" over. When this point is reached the amplification due to regeneration is highest. To illustrate this action the hook-up herewith is given. It is a combination regenerative and non-regenerative hook-up. The switch in the plate circuit is the factor controlling the non-regenerative and regenerative hook-ups. By following the explanation given above the principle of regenerative and non-regenerative circuits can be easily followed. When the switch is on S the circuit is regenerative, the feed-back coil (L-3) of the plate circuit being in the plate circuit, and re-transferring the plate circuit energy back into the grid circuit to strengthen the original current in the circuit. When the switch is in the opposite position the circuit will not regenerate because the plate circuit has no means of feeding back.



Combination circuit illustrating feed-back and straight circuit. When switch is on S circuit is regenerative.

ADVANTAGES OF REGENERATION: It is possible by means of regeneration to get an enormous amount of self-amplification on one tube. With some signals, especially when the set is tuned properly, it is possible to receive signals with an amplification of one stage of audio-frequency amplification, and sometimes even more, all depending upon the manner in which the regeneration is handled. This is partly due to the fact that the principle of radio-frequency amplification is brought into play because the signals in the plate coil are superimpressed upon the signals in the grid circuit, which are of radio-frequency.

The Daily Paper Radio Situation in New York City

The purchase by Frank A. Munsey of the New York "Globe" has stirred up things considerably as far as radio and the daily papers are concerned. Mr. Munsey, who thinks nothing of killing a publication that no longer interests him, divided the various "Globe" features between the "Sun" and the "Evening Telegram." The "Sun" gets the radio section and it is understood that for the time being at least the radio staff will remain intact. The "Evening Mail" expected to make considerable capital out of the fact that the "Globe" as a separate entity was no more. This gladsome view, however, was changed when the "Evening World" announced that it would almost immediately start a radio section to go with its Saturday edition. This move of the "Evening World" is really a triumph for radio. The Pulitzers have always figured that the "Morning World" and "Evening World" were primarily for news and while they contained features, they are not regarded as feature papers in the same sense as the "Globe" was. For instance, some years ago, an attempt was made to have the "Evening World" establish a theatrical department on the order of Zit's department in the "Evening Journal," but Ralph Pulitzer put down his foot hard and declared that he would not consider the proposition. The determination of the "Evening World" therefore to publish a radio section is ample proof that the publishers have made a thorough investigation of radio, have made up their minds that it is here to stay, and that it is a good circulation getter.

All of which is good grist for the radio mill—for the more daily papers that are devoted to radio, the better it is for the whole science, art and business of radio, even tho these papers cannot be expected to cover the field outside their own distribution limits.

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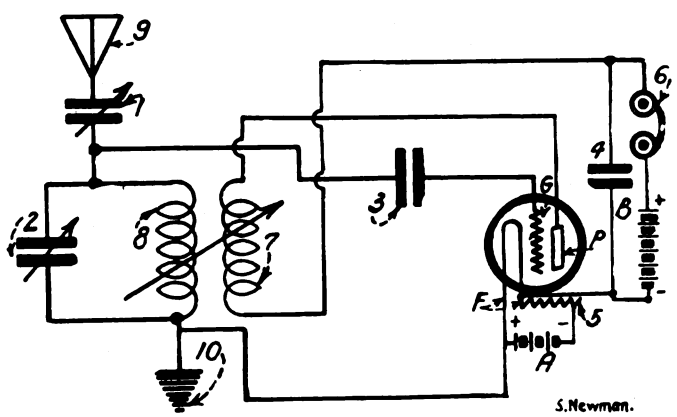
A Portable Set with "Roller Skate" Attachment

(*Concluded from front cover page*)

up in the space between the panel and front cover. The filament rheostat can be seen in the lower right hand corner where it connects directly to the A battery. It will be noticed that the phone terminals are also located where the shortest possible wires serve for connections. The right hand dial controls a vernier condenser connected across the primary coil. This condenser is made of two circular brass plates about four inches in diameter, one screwed onto the back of the panel and the other soldered to the head of a ¼-inch stove bolt which is threaded through the panel. The dial is attached to the opposite end of the stove bolt. The one plate, therefore, rotates with the dial and owing to the threaded support moves toward or away from the stationary plate as indicated in the sketch. A spring contact rubs against the movable plate while the other connection is attached to the



Circuit used by Brown in constructing his portable set. (1) 43 plate condenser. (2) Special 2 plate vernier. (3) Grid condenser (no leak). (4) Phone condenser. (5) Filament rheostat. (6) Phones. (7) Secondary of coupler. (8) Primary of coupler. (9) Antenna. (10) Ground.

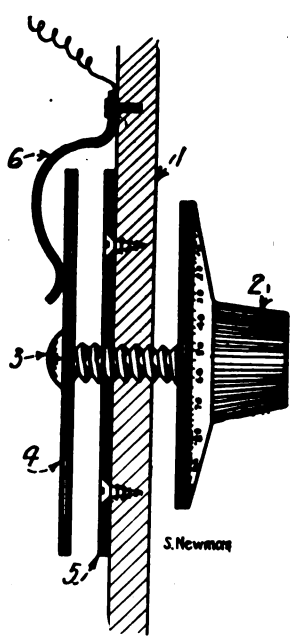
(*Concluded from cover page*)

stationary plate. This condenser serves the same purpose as the ordinary vernier making it possible to choke off WHN and pick up WGY or vice versa. We have also tuned out both WJZ and WEAF and picked up WGY without the usual squeals and yowls. This, however, requires considerable patience as one must hold one's breath and refrain from the slightest movement. Body capacity, of course, has a decided effect owing to the wood panel, used for its beautiful, ingrain effect. If when approaching the panel, Uncle Roxy of Capitol fame, comes in funnier, this indicates more capacity is required on the condenser. If it squeals and you miss one of his jokes turn it the other way quick and there you are. We have just been listening to him and his Mike broke down under the strain. Even the vernier condenser can't help that. The left hand dial controls the 43 plate condenser in series with the antenna. Most of the tuning is done with this dial. The center dial controls the rotor or tickler coil and thereby the amount of regeneration.

Needless to say, a WD-11 tube is used with a 1½-volt A battery. The 45 volt B battery is located in a separate compartment. A 1½-volt flash light bulb and socket are attached to the positive terminal of the B battery as a fuse. This ten cent ballast bulb is not even lighted by the small amount of current drawn from the B battery but would at once burn out should any wires be accidentally crossed. This would save my WD-11. The home made variocoupler is of the basket variety. Exactly 60⅓ turns are used on the rotor or tickler coil and also on the primary which is the secondary as well. You may find that 49½ turns work equally well if too many turns are not wound on the water pipe ground connection. We are originally from Missouri and have very little faith in the electronic theory. At any rate, a little experimenting will prove that the correct number of turns may be used to tune from 200 to 600 meters without taps or switches. A condenser from an automobile ignition coil is used in place of the regulation grid leak and condenser.

Now the "Roller Skate" attachment or the little Saxon roadster as it was once known, comes in very handy as a counterpoise. The set was in actual operation when the photo was taken, the frame of the "Roller Skate" being used as a ground. WEAF 25 miles away came in loud enough to be heard three or four feet from the phones. We measured it with a steel tape to verify this statement. The tape is in my right rear pocket. WJZ or WEAF were tuned in or out at will. The 150 ft. roll of bell wire was used as an antenna. One end tied to a stone was thrown over a nearby tree. We would suggest tying the stone very carefully and keeping the wife and child well out of the way. Also do not attach the wire to the set till the stone stops—otherwise the concert may be all off. A sour high C caused the wife's sad expression.

To sum up, allow me to say this is a real Hum Dinger portable set. The batteries, phones, dials, antenna, etc., can all be enclosed and protected by the



Constructional details of the special vernier condenser used in the Brown circuit.

cabinet which is only 8x8x14 inches and weighs less than 20 lbs. When touring with the Saxon, the tube is removed from the socket and carefully wrapped in flannel if the weather is cold. This also obviates the necessity of shock absorbers on the car. The set will operate six pairs of head phones in series. We have attached three of them to an extension line running to different parts of the house and discovered that we could telephone one another while listening to the radio concerts.

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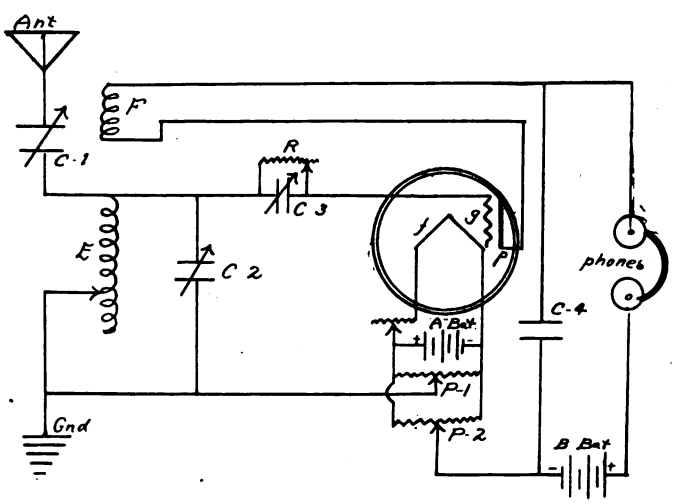
An Extremely Selective Single Circuit Receiver

By C. White, Consulting Engineer

THE general tendency in receivers has been simplicity in control. In fact, the general demand has been for a radio set that would be selective and tune with only one dial. The combination of simplicity with reliability is not an easy matter, since certain advantages must be sacrificed in order to make a receiver simple, and it is a general rule that this is done at the expense of reliable operation. One of the most familiar simplified circuits is the well-known "flivver" circuit. Such a circuit tunes in with a single dial, or can be so constructed and operated to do so; but the secret of the whole circuit lies in a constant critical value of grid leak resistance. If the atmospheric conditions, such as moisture, change it is almost a sure guess that the value of your grid leak will change. In fact, I have seen flivver sets that work splendidly one night and on the next, for some reason, it would be almost impossible to secure any reliable results. Then after fooling around with the grid leak the circuit could be restored to its normal working condition. I am not in any way trying to hit the flivver circuit in the least, for I have heard many such circuits, and the results obtained on many were nothing short of remarkable considering the fact that they are simplicity itself. I am simply bringing forth the fact that many receivers that apparently have only a few external adjustments really depend upon other adjustments, such as the grid leak, to keep them in normal condition. Then, again, if a circuit only affords one method of tuning in, how are you going to tune in when interference is bad? There is only one method with a single control tuning set, and if conditions are bad when it is desired to have clear reception there is no other dodge or means left. With the type of circuit outlined in this article there are about twelve different ways to tune in a station, and if perchance poor results are obtained with two or more methods you still have some others left to try. In addition this set affords ample opportunity to experiment and find out just what the various controls do and how they alter reception under certain conditions. It will elevate the average amateur who builds it to the plane of an experimenter, and will not allow him to remain a dial turner until he sees fit to purchase another outfit.

Aside from the fact that the multiple controlled set allows flexible tuning and experimentation it is just as simple to build as any set, only it requires a few more parts. But when all its advantages are summed up it is well worth the trouble and expense of the extra parts. In fundamental theory the circuit is nothing more than the ordinary single-circuit regenerative with a tuning condenser C-2 shunted across the tuning inductance coil E. We can tune in by means of C-1 and E, or by means of C-2 and E, or, better still, by means of the three together. When using the latter method it is better to approximately tune in with C-1 and E, then use C-2 to put on the fine touches. In constructing the receiver you should take care to see that the movable plates of the condenser, C-2, are connected into the filament or ground side of the circuit instead of the grid side. By so doing it is possible to cut down body capacity to a minimum, since the shaft of the condenser is at the same ground potential as the operator's body. A variable grid leak resistance makes it possible to clarify the signal and at the same time raises the volume. You cannot imagine just how important this apparently small part of the set is on the quality of reception. The variable grid condenser allows still further manipulation of the grid circuit constants, and by its adjustment the best detecting portion of the tube's characteristic is assured for use. The potentiometer P-1 renders a vernier action on the amount of regeneration and stability of the circuit. At first the action of the potentiometer P-1 will seem to only increase and decrease the volume, but by careful adjustment of the amount of regeneration on distant signals it is possible to use P-1 to an advantage in holding the tube stable and prevent it from falling over into oscillation. The action of P-2 is somewhat similar to the action of P-1, but it is not so fine. But by the careful use of the two we can assure smooth regeneration, accompanied with the minimum amount of tube noises.

The constants for the circuit illustrated are as follows: The condensers C-1 and C-2 are 11 or 13 plate air variables, with some sort of vernier either built in or externally



A single circuit set can be made super-selective by the use of two potentiometers as shown in this drawing.

connected. The coil E is the stator of a 180-degree coupler, and the coil F is the rotor. By varying the coupling smoothly through 180 degrees action of the coupler it is quite possible to vary evenly the amount of regeneration. The condenser C-3 is a three plate air variable, such as is commonly employed as a vernier. This condenser should have a maximum capacity of .0003 mfd. The leak resistance R should be one of the few panel types on the market. The panel mounting of this important part of the circuit permits ease in operation, thus obviating the necessity of diving into the wiring of the set to vary the leak resistance. The potentiometers P-1 and P-2 should have a resistance of 300 or more ohms. apiece. The condenser C-4 is a fixed mica condenser of .0025 mfd. capacity. In wiring up the set try to keep the grid wire as short as possible. This means that the tube must be mounted very near the variable grid condenser C-3.

For the amateur who really wants to know what varying the constants of the different parts of the circuit will do, this receiver allows ample room for successful experimentation, and still allows the receiver to be kept in the panel form. It is the ideal set for the amateur who likes to find out for himself the how and why of things.

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Latest Offical List of Broadcasting Stations in the United States

FOLLOWING is the second installment of an official list of commercial broadcasting stations in the United States as issued by the Department of Commerce, and is continued from last week's issue. The list will be continued in next week's RADIO WORLD.

As new allocations of wave lengths to stations now operating on 360 meters are made by the Department of Commerce, the changes will be published by RADIO WORLD.

Readers who save these installments will have a complete list of broadcasters with their station calls, location, frequency, wave lengths and power.

Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
WLAX	Greencastle Community Broadcasting Station, Greencastle, Ind...	1,300	231	5
WQAZ	Greensboro Daily News, Greensboro, N. C.	833	360	30
WSAJ	Grove City College, Grove City, Pa.	833	360	100
WHAH	Hafner Supply Co., Joplin, Mo....	833	360	20
KPO	Hale Bros., Inc., San Francisco, Cal.	710	423	500
KGG	Hallock & Watson Radio Service, Portland, Ore.	833	360	100
WLK	Hamilton Mfg. Co., Indianapolis, Ind.	833	360	500
WOAT	Hamp, Boyd Martell, Wilmington, Del.	833	360	250
WOAA	Hardy, Dr. Walter, Ardmore, Okla.	833	360	20
WDAK	Hartford Courant, Hartford, Conn.	833	360	50
KFDP	Hawkeye Radio Supply Co., Des Moines, Ia.	1,080	278	100
WEAS	Hecht Co., Washington, D. C.....	833	360	50
WIAI	Heers Stores Co., Springfield, Mo..	833	360	20
KFGV	Heidbreder Radio Supply Co., Utica, Neb.	1,340	224	10
WEAD	Henry Radio & Elect. Supply, Atwood, Kan.	1,120	268	100
KXD	Herald Publishing Co., Modesto, Cal.	833	360	5
KQW	Herrold, Charles D., San Jose, Cal.	833	360	50
WFAJ	Hi Grade Wireless Inst. Co., Asheville, N. C.....	833	360	50
WHAO	Hill, F. A., Savannah, Ga.....	833	360	50
WAAZ	Hollister Miller Motor Co., Emporia, Kan.	833	360	50
KFBE	Horn, Reuben H., San Luis Obispo, Cal.	833	360	10
WJD	Howe, Richard Harris, Granville, Ohio	1,310	229	50
WGL	Howlett, Thomas F. J., Philadelphia, Pa.	833	360	250
WDAI	Hughes Electrical Corp., Syracuse, N. Y.	833	360	250
WQAV	Huntington & Guerry, Inc., Greenville, S. C.....	833	360	100
WHAY	Huntington Press, Huntington, Ind.	833	360	10
WEV	Hurlburt-Still Electrical Co., Houston, Texas	833	360	250
WJAG	Huse Publishing Co., Norfolk, Neb.	833	360	100
WFAN	Hutchinson Elect. Service Co., Hutchinson, Minn.	833	360	100
WLAZ	Hutton & Jones Elect. Co., Warren, Ohio	1,210	248	10
WNAM	Ideal Apparatus Co., Evansville, Ind.	833	360	100
KFAU	Independent School District of Boise City, Boise, Idaho.....	833	360	5
WGV	Interstate Electric Co., New Orleans, La.	833	360	100
WOI	Iowa State College, Ames, Ia.....	833	360	500
WEAY	Iris Theatre, Houston, Texas.....	833	360	1,000
KFDZ	Harry O. Iverson.....	833	360	5
WJAD	Jackson's Radio Eng. Lab., Waco, Texas	833	360	150
WBAO	James Milliken Univ., Decatur, Ill..	833	360	50
WPAS	J. & M., Electric Co., Amsterdam, New York.....	833	360	20
WSL	J. & M. Electric Co., Utica, N. Y..	833	360	250
KFIB	Jenkins, Franklin W., St. Louis, Missouri	1,230	244	10
KFFB	Jenkins Furniture Co., Boise, Idaho	833	360	10
WAAB	Jensen, Valdemar, New Orleans, La.	1,120	268	100
WCAC	John Fink Jewelry Co., Fort Smith, Arkansas	833	360	20
WLAP	Jordon, W. V., Louisville, Ky.....	833	360	15
WIAB	Joslyn Automobile Co., Rockford, Illinois	833	360	50
WIAK	Journal Stockman Co., Omaha, Neb.	1,080	278	200
WOAP	Kalamazoo College, Kalamazoo, Michigan	833	360	100
WMAX	K. & K. Radio Supply Co., Ann Arbor, Mich.....	833	360	250
WCBB	K. & K. Radio Supply Co., Greenville, Ohio.....	1,250	240	100
WIK	K. & L. Electric Co., McKeesport, Pennsylvania	833	360	250
WDAF	Kansas City Star, Kansas City, Mo.	730	411	500
WTG	Kansas State Agricultural College, Manhattan, Kan.....	833	360	1,000
WCAE	Kaufmann & Baer Co., Pittsburgh, Pennsylvania	650	462	500
WJAT	Kelley-Vawter Jewelry Co., Marshall, Mo.....	833	360	25
WJAP	Kelly-Duluth Co., Duluth, Minn...	833	360	100
WCAY	Kesselman O'Driscoll Co., Milwaukee, Wis.....	833	360	100
KFBK	Kimball-Upson Co., Sacramento, California	833	360	150
WMAY	Kingshighway Presbyterian Church, St. Louis, Mo.....	833	360	100
KFFR	Kirk, Jim, Sparks, Nevada.....	833	360	10
KFDL	Knight-Campbell Music Co., Denver, Colo.....	833	360	5
WPAZ	Koch, John R., Charleston, W. Va.	1,100	273	10
WNAW	Kunzman, Henry, Fort Monroe, Va.	833	360	5
WKAV	Laconia Radio Club, Laconia, N. H.	833	360	100
WABA	Lake Forest College, Lake Forest, Illinois	1,130	266	100
WABH	Lake Shore Tire Co., Sandusky, O..	1,250	240	100
WGAL	Lancaster Elect. Supply & Const. Co., Lancaster, Pa.....	833	360	75
WHAL	Lansing Capitol News, Lansing, Michigan	1,210	248	20
KFIC	Laskowitz, Philip, Denver, Colo....	1,340	224	15
WABB	Lawrence, Dr. John B., Harrisburg, Pa.....	1,130	266	10
KFBL	Leese Bros., Everett, Wash.....	1,340	224	10
KFGH	Leland Stanford, Jr., University, Stanford University, Cal.....	833	360	500
WNAT	Lennig Bros., Co., Philadelphia, Pa.	833	360	250
WSAH	Leonard, Jr., A. G., Chicago, Ill...	833	360	500
WGAU	Limb, Marcus G., Wooster, Ohio..	1,330	226	20
KMC	Lindsay, W. W., Jr., Reedley, Cal...	833	360	100
WKAS	Lines Music Co., L. E., Springfield, Mo.....	833	360	50
WDAR	Lit Bros., Philadelphia, Pa.....	760	395	500
WGAN	Lloyd, Cecil E., Pensacola, Fla....	833	360	50
KFGB	Loewenthal Bros., Pueblo, Col....	833	360	10
WRAM	Lombard College, Galesburg, Ill....	833	360	100
KWH	Los Angeles Examiner, Los Angeles, Cal.....	833	360	150
KFCL	Los Angeles Union Stock Yards, Los Angeles, Cal.....	833	360	500
KFGC	Louisiana State University, Baton Rouge, La.....	1,180	254	100
KMO	Love Electric Co., Tacoma, Wash...	833	360	10
WWL	Loyola Univ., New Orleans, La...	833	360	100
WOAR	Lundskow, Henry P., Kenosha, Wis.	833	360	100
WOAO	Lyradion Mfg. Co., Mishawaka, Ind.	833	360	50
WKAX	Macfarlane, Wm. A., Bridgeport, Connecticut	833	360	50
KFCV	Mahaffey, Jr., Fred, Houston, Tex.	833	360	50
WWAY	Marigold Gardens, Chicago, Ill....	833	360	500
KFFQ	Marksheffel Motor Co., Colorado Springs, Col.....	833	360	10

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Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
WBAW	Marietta College, Marietta, Ohio..	833	360	250
WHAD	Marquette University, Milwaukee, Wisconsin	833	360	100
WDAG	Martin, J. Laurence, Amarillo, Tex.	1,140	263	100
WOAC	Maus Radio Co., Lima, Ohio.....	1,130	266	100
WBS	May, D. W., Inc., Newark, N. J....	833	360	20
KFAD	McArthur Bros. Mercantile Co., Phoenix, Ariz.	833	360	250
WTP	McBride, Geo. M., Bay City, Mich.	833	360	10
KFHH	McCue, Ambrose A., Neah Bay, Wash.	1,060	283	50
KFFX	McGraw Co., The, Omaha, Neb....	1,080	278	250
KFEC	Meier & Frank Co., Alder St., Portland, Ore.	833	360	5
KFDB	Mercantile Trust Co. of California, San Francisco, Cal.	590	509	750
WHAZ	Mercer University, Macon, Ga.....	1,120	268	50
WOU	Metropolitan Utilities District, Omaha, Neb.	833	360	50
WFAW	Miami Daily Metropolis, Miami, Florida	833	360	50
WKAR	Michigan Agricultural College, East Lansing, Mich.	833	360	250
WBAF	Middleton, Fred M., Moorestown, New Jersey	833	360	100
WOAE	Midland College, Fremont, Neb.....	833	360	20
WEH	Midland Refining Co., Tulsa, Okla.	833	360	500
WDAP	Midwest Radio Central, Inc., Chicago, Ill.	833	360	200
WOS	Missouri State Marketing Bureau, Jefferson City, Mo.	833	360	20
WFAQ	Missouri Wesleyan College & The Cameron Radio Co., Cameron, Missouri	833	360	50
WEAP	Mobile Radio Co., Inc., Mobile, Alabama	833	360	10
KIN	Monterey Elect. Co., Monterey, California	833	360	100
KFCF	Moore, F. A., Walla Walla, Wash.	833	360	50
WQAE	Moore Radio News Station, Springfield, Vt.	833	360	150
KFCQ	Motor Service Station, Casper, Wyo.	833	360	50
WABF	Mt. Vernon Register News Co., Mt. Vernon, Ill.	1,280	234	250
KGB	Mullins Elect. Co., Wm. A., Tacoma, Washington	833	360	100
KGU	Mulrony, Marion A., Honolulu, Hawaii	833	360	100
KFGJ	National Guards Missouri, St. Louis, Mo.	1,130	266	100
KFDU	Nebraska Radio Elect. Co., Lincoln, Nebraska	833	360	20
WCAJ	Nebraska Wesleyan University (Lincoln, Neb.), University Place, Neb.	833	360	20
WAAM	Nelson Co., I. R., Newark, N. J....	1,140	263	250
WAAM	Nelson Co., I. R., Newark, N. J....	833	360	250
KDZK	Nevada Machinery & Elect. Co., Reno, Nevada	833	360	25
WBBA	Newark Radio Lab., Newark, O....	1,250	240	20
WCAB	Newburgh News Printing & Pub. Co., Newburgh, N. Y.	833	360	75
WAAQ	New England Motor Sales Co., Greenwich, Conn.	833	360	100
KOB	New Mexico College of Agri. & Mech. Arts, State College, N.M.	833	360	500
WLAW	New York Police Dept., New York, N. Y.	833	360	500
WIAV	New York Radio Laboratories, Binghamton, N. Y.	833	360	50
WEAG	Nichols Hineline Bassett Lab. Edgewood, R. I.	1,200	231	10
KFCB	Nielsen Radio Supply Co., Phoenix, Arizona	833	360	50
WIAT	Noel, Leon T., Tarkio, Mo.	833	360	15
WLAC	North Carolina State College, Raleigh, N. C.	833	360	750
WPAK	North Dakota Agricultural College, Agricultural College, N. D....	833	360	250
WEAM	North Plainfield, Borough of North Plainfield, N. J.	1,190	252	50
WLAY	Northern Commercial Co. of Alaska	833	360	50
WRAL	Northern States Power Co., St. Croix Falls, Wis.	1,210	248	100
KJR	Northwest Radio Service Co., Seattle, Wash.	1,110	270	100
WGAY	North Western Radio Co., Inc., Madison, Wis.	833	360	50
KGN	Northwestern Radio Mfg. Co., Portland, Ore.	833	360	50
WMAK	Norton Laboratories, Lockport, N. Y.	833	360	500
WPG	Nushawg Poultry Farm, New Lebanon, Ohio	833	360	30
WIAD	Ocean City Yacht Club, Ocean City, N. J.	1,180	254	10
WAAD	Ohio Mechanics Institute, Cincinnati, Ohio	833	360	25
WEAO	Ohio State University, Columbus, Ohio	833	360	250
WKAK	Okfuskee County News, Okemah, Okla.	833	360	100
KFAH	Olesen, O. K., Hollywood, Cal.....	833	360	100
KFCZ	Omaha Central High School, Omaha, Neb.	833	360	300
WAAW	Omaha Grain Exchange, Omaha, Neb.	833	360	200
WGAM	Orangeburg Radio Equipt. Co., Orangeburg, S. C.	833	360	50
KFDJ	Oregon Agricultural College, Corvallis, Ore.	833	360	50
KDYQ	Oregon Institute of Technology, Portland, Ore.	833	360	10
WHAP	Otta & Kuhns, Decatur, Ill.	833	360	20
WJAR	Outlet Co., The, Providence, R. I...	833	360	200
WKAA	Paar, H. F., and Republican Times, Cedar Rapids, Ia.	833	360	20
WIAR	Paducah Evening Sun, Paducah, Ky.	833	360	100
WMAC	Page, J. Edward, Cazenovia, N. Y.	833	360	200
WOC	Palmer School of Chiropractic, Davenport, Ia.	620	484	500
WOAH	Palmetto Radio Corp., Charleston, S. C.	833	360	10
WMAT	Paramount Radio Corp., Duluth, Minn.	833	360	50
WNAB	Park City Daily News, Bowling Green, Ky.	833	360	100
WABD	Parker High School, Dayton, Ohio.	1,060	283	10
WGAQ	Patterson, W. G., Shreveport, La...	833	360	150
KFHL	Penn College, Oskaloosa, Ia.	1,320	227	10
WOAV	Pennsylvania National Guard, Erie, Pa.	1,240	242	100
WPAB	Pennsylvania State College, State College, Pa.	833	360	1,000
WBAK	Pennsylvania State Police, Department of, Harrisburg, Pa.	833	360	500
WTAC	Penn Traffic Co., Johnstown, Pa...	833	360	150
WNAV	Peoples Tel. & Tel Co., Knoxville, Tenn.	833	360	500
WJAN	Peoria Star Co., Peoria, Ill.	1,070	280	100
WJAM	Perham, D. M., Cedar Rapids, Ia..	833	360	20
WPAF	Peterson's Radio Co., Council Bluffs, Ia.	833	360	10
WOAZ	Penick Hughes Co., Stamford, Texas	833	360	100
WPAP	Phillips, Theodore D., Winchester, Ky.	833	360	10
WHAW	Pierce Elect. Co., Tampa, Fla.....	833	360	10
KFFY	Pincus & Murphey, Inc., Alexandria, La.	1,100	275	100
WCK	Pine Bluff Company, The, Pine Bluff, Ark.	833	360	500
WJAS	Pittsburgh Radio Supply House, Pittsburgh, Pa.	833	360	250
WSAT	Plainview Electric Co., The, Plainview, Texas	833	360	20
WKAH	Planet Radio Co., West Palm Beach, Fla.	833	360	50
KWG	Portable Wireless Telephone Co., Stockton, Cal.	833	360	100
KGW	Portland Oregonian, Portland, Ore.	610	492	500
WOAQ	Portsmouth Kiwani's Club, Portsmouth, Va.	833	360	15
WMH	Precision Equipment Co., Cincinnati, Ohio	1,210	248	10
WQAR	Press Publishing Co., Muncie, Ind.	833	360	10
KSS	Prest & Dean Radio Research Laboratory, Long Beach, Cal..	833	360	10
WQAS	Prince Walter Co., Lowell, Mass..	1,130	266	100
KSD	Pulitzer Publishing Co., St. Louis, Mo.	550	546	500

(To be continued next week)

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Radio Pictures From Near and Far D

CAPTIONS BY ROBERT L. DO

(C. Underwood and Underwood)
"Uncle Joe" Cannon listening in on the world at his home in Danville, Ill. Just to show how interested he is in radio we want to call attention to the fact that "Uncle" has forgotten his cigar without which he has never before posed. The set was presented to him as a birthday gift by the Westinghouse Electric & Mfg. Co.

(C. Western Electric)
An interested audience of the broadcast of the Willard-Johnson bout was a group of ex-service men at the Manhattan State Hospital on Ward's Island. A complete radio set consisting of a tuner, amplifier and loud speaker was presented to the hospital by the Bill Brown Post 507, of Brooklyn. The listeners are all ex-service men under treatment for shell-shock or other illnesses.

Radio Instruction for th

(C. Keystone View)
Experimental laboratory at the Royal Military College, Sandhurst, Eng. The students ar apparatus obtainable under the competen ction of Army Co

THE fact that radio is important in army work has long been accepted in America, and competent instruction has always been available to any who wanted to study this important branch of army work. It is only lately that instruction has been given in England, however. The Royal Military College of Sandhurst, England, which is the West Point of the United Kingdom, was one of the first to recognize the advantages gained by including radio

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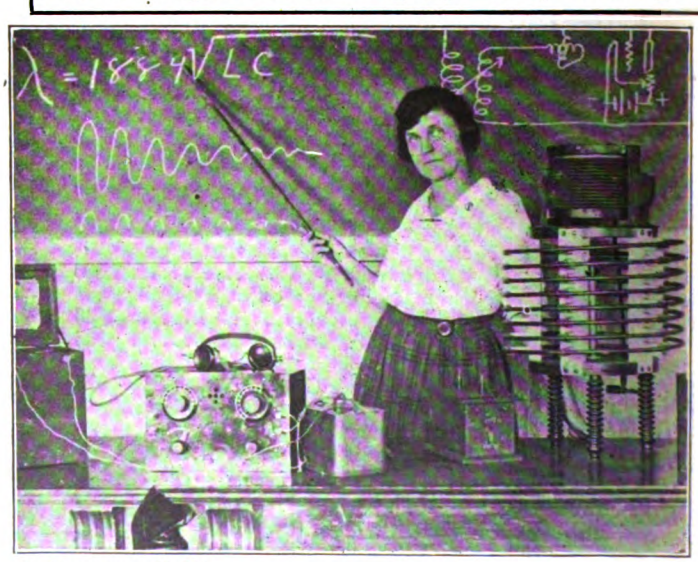
(C. Fotograms, N. Y.)
Another Parisian fad for American girls. Miss Isobelle Bennett, who is an ardent fan, had a small set put in her parasol and by means of a loop which was woven between the ribs of the umbrella was enabled to receive the local broadcast while out for a ride in her cabriolet along the Champs Elysees. Go to it girls, try ticklin' American ribs!



(C. Fotograms, N. Y.)
Miss Mary T. Loomis, of Washington, D. C., the only woman who personally conducts a radio school. Her father, Dr. Mahlon Loomis, was one of the earliest scientists to experiment with radio, and Miss Loomis is a graduate radio engineer. She is shown instructing a class in the elementary theory of radio.

International News
christened by
Alfred Jerome
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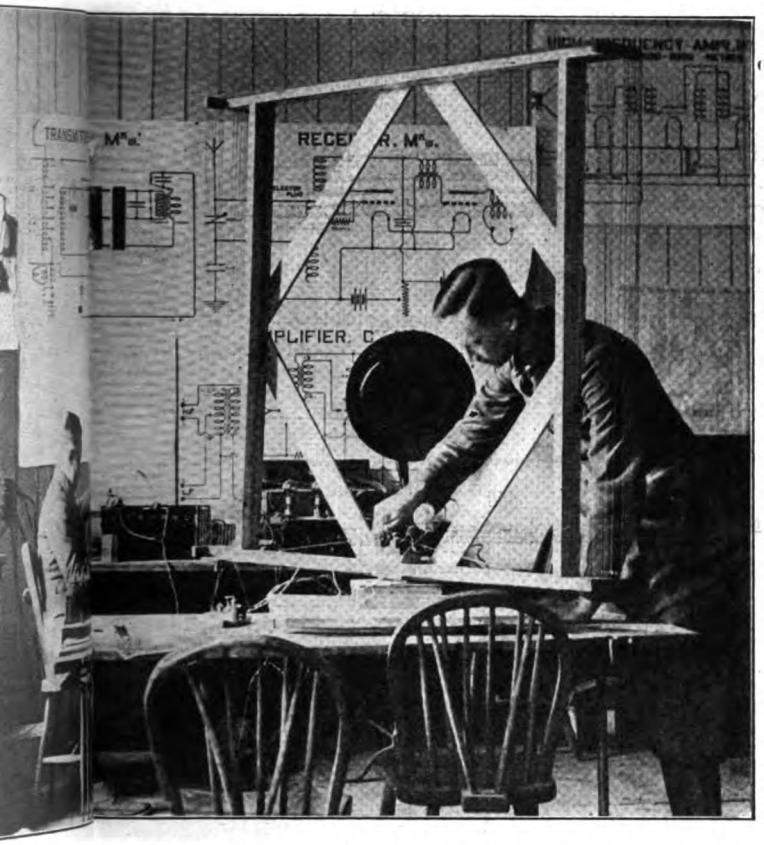
m Near Far Depict Interesting Episodes

CAPTIONS BY HERT L. DOUGHERTY

ruction for the British Army



ilitary College, Sandhurst, England. The students are allowed to work their problems out on the best obtainable under the instruction of Army Communication Chiefs.

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ngdom, was co
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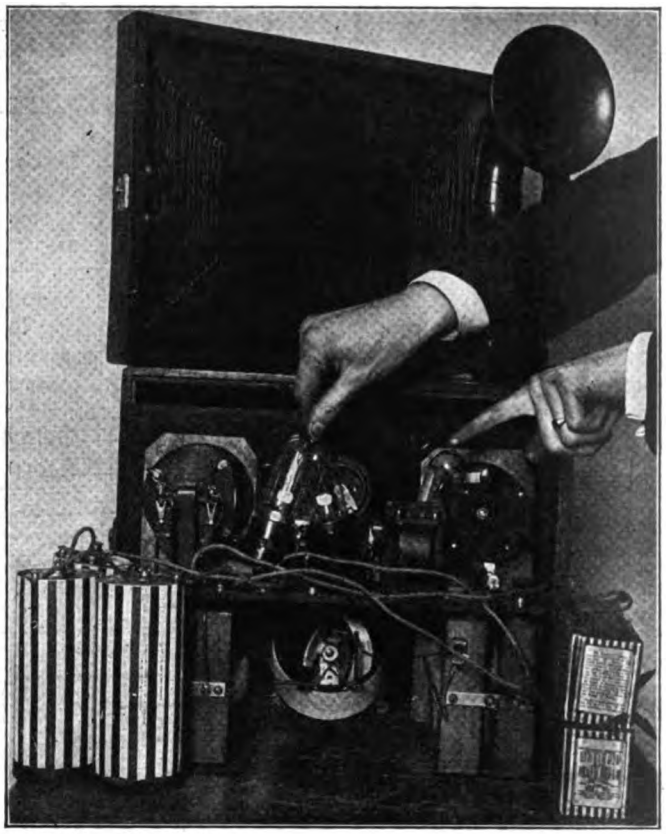
as a part of the course. Accordingly a powerful transmitter was installed and a radio course given.

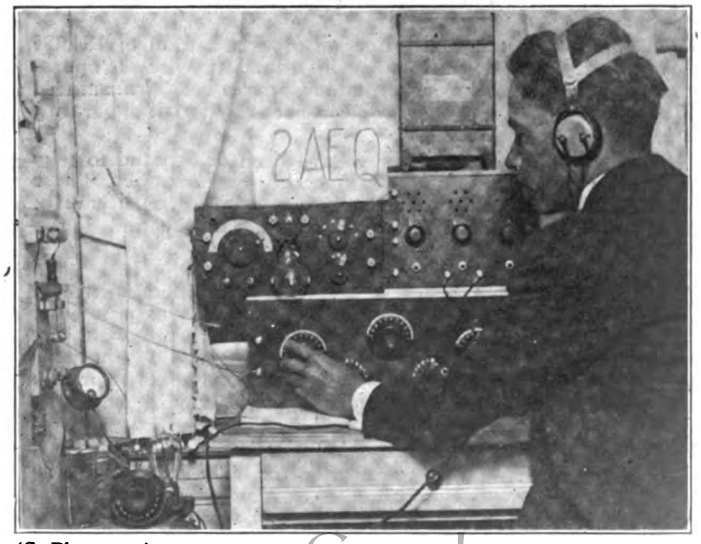
It was found that a great many of the students had a working knowledge of the science, but, of course, that had only been gained from their own experiments and from the following of the science through the various books and papers. A complete laboratory was installed, as well as a broadcasting station which the students operate.

(C. International Newsreel)
Getting christened by radio is not the commonest thing in the world, so Master Alfred Jerome Schroth can readily say that he is one of the few radio babies. The ceremonies took place at WHN, Ridgwood, L. I., and were heard by thousands of listeners.



(C. Kadel and Herbert)
One of the sets that is going to bring happiness to its owner this summer. Sterling C. Sears, a Brooklyn amateur, built it, and, with a view to making it absolutely safe, mounted the tubes on rubber pads to keep them from breaking. The tubes can be jarred without any danger.

(C. Kadel and Herbert)
Self-contained four-tube reflex set built by William Henderson, who is going to make sure of getting his full share of concerts and music this summer. The set is all contained in the box, even to a loud speaker.



(C. Photonews)
Allen Fitch and his radio station 2AEQ. This station, which is one of the A. R. R. L. Eastern branch, handles on an average of 1,700 messages per month. A single tube five watt transmitter is used and a distance of 1,200 miles has been covered with it.

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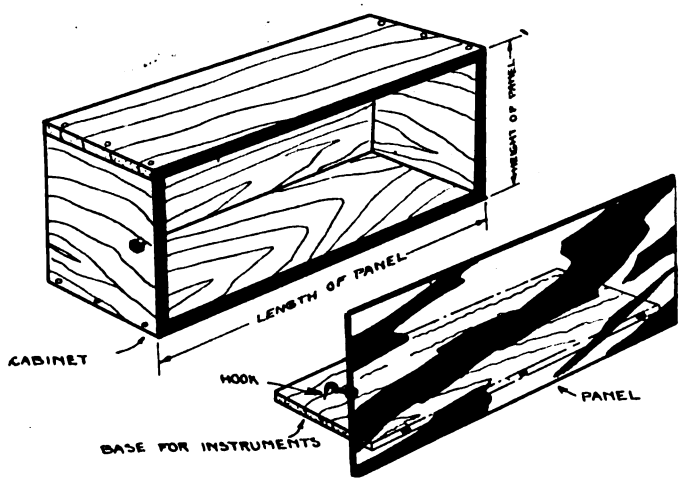
A New Idea in Cabinet Construction

By Arthur S. Gordon

THIS original idea in cabinet construction is the logical outcome of the radio amateur's need for plenty of room while testing or adjusting his receiver. Ordinarily, when something goes wrong with the outfit, the enthusiast raises the lid of the cabinet, puts his hand down between the tube socket and the rheostat and forthwith tries to tighten a nut or start a machine screw in its lawful thread. It can't be done. In the subsequent process of trying, however, the radio amateur becomes very much peeved, to say the least. Before the operation is over he has probably pulled the entire cabinet apart, leaving only the base and the panel front. He would have torn



An idea in cabinet construction that will tend to improve the appearance of your set.

them away also if there were no instruments attached to them.

This mad wrecking of material in order to reach parts in need of repair is not necessary if the cabinet is built along the lines suggested herewith. All that is necessary is to release two hooks, take a firm hold upon the panel, pull it forward, and the entire receiver, from the vario-coupler down to the last microfarad of condenser capacity, will leave the dark recesses of the cabinet and come forth into view.

Looking at the sketch which accompanies this description the reader will note at once that the base of the cabinet is entirely separate from the base on which the instruments are mounted. This separate base is the secret of the idea's successful application. To it is fastened the panel and upon it are mounted all the instruments that formerly found a place on the bottom board of the box. The double base is of such a size that it will readily slip inside the completed cabinet. It should be made of wood, about ½-inch thick, and, when the radio receiver is completely assembled, should rest upon the base of the cabinet.

The panel is fastened to the instrument base by three screws. It is not necessary to further reinforce the base by either a brace or a brass standard, for when the instruments are all in place the unit will be found to be firm and solid. The panel is secured to the cabinet by means of either hooks or screws. Hooks are shown in the sketch, and are recommended because of the greater ease with which the panel may be released from the cabinet. There is no real objection to using screws, however, aside from the extra holes needed in the face of the panel.

The cabinet is a solidly constructed box, built so that its outside dimensions are the same as those of the panel. It is made of wood. There are no hinges necessary. The depth may vary according to the needs of the builder, but six inches is the average dimension. One feature of this slip-in-and-out arrangement that will not pass unappreciated is that the cabinet can be screwed down to the radio table. When firmly fastened in this way it provides a safe receptacle for the radio receiver, mounted on the panel and separate base, as here described.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

The Public Health Service will broadcast this week messages on hay fever and weeds from NAA on 435 meters.

* * *

The American Radio Relay League reports a total of 184,085 radio messages handled during April by amateur wireless operators in North America. Continuous wave sets transmitted 172,763 of the messages and 11,322 were sent by spark apparatus.

* * *

Five junior officers of the Navy have been designated to take post graduate courses in radio engineering at Annapolis. These potential radio engineers of the Navy are Lieuts. J. R. Redman, Arthur W. Peterson, E. E. Stone, L. M. Harvey and J. M. Smith.

* * *

The British Government has appointed a special committee of distinguished scientists to aid in wireless telephony experiments. Sir Joseph Thomson, one of England's foremost electrical experts, said he believed wireless telephony soon would be a commercial possibility because of the perfection of instruments which would be able to conquer atmospheric conditions.

* * *

President Harding on his forthcoming western trip will use a special Pullman car now being outfitted for his service. One feature will be a radio broadcasting set, which will be located at the observation end and be so arranged that while the President speaks from the platform the speech will be broadcast to all parts of the country. The radio will be one of the most powerful sets ever placed on a car.

Wireless Review is the name of a new British radio weekly just launched. Its scientific adviser in chief is Sir Oliver Lodge. In the initial issue a prize of £500 is offered to the first British subject who best demonstrates the practical possibility of wireless television, or seeing by wireless objects invisible to normal sight.

* * *

Station WOC, owned and operated by the Palmer School of Chiropractic, Davenport, Iowa, has issued an interesting and profusely illustrated booklet describing the station. Those who have enjoyed the splendid organ recitals and other attractive program features sent out from WOC doubtless will be interested in seeing this booklet.

* * *

Summer sessions covering specialized engineering subjects in concentrated form have been established at the Massachusetts Institute of Technology, Cambridge, Mass. A number of electrical courses of interest to advanced radio students are scheduled. A bulletin and full particulars may be obtained from T. H. Dillon, Director of the Summer Session.

* * *

Bert Jarvis, a boat liveryman of Theresa, N. Y., will receive $2,000 reward for recovering 6-year-old Verner Alexanderson, kidnapped son of E. F. Alexanderson, radio engineer. Jarvis found the boy in a woodland cottage on the banks of the Indian River, near Theresa, where the abductors, believed to be Harry Fairbanks and Stanley Crandall, had hidden him in charge of an elderly woman. Fairbanks and Crandall now are sought in Canada.

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Latest Radio Patents

Method of Secret Signaling

No. 1,454,532: Patented May 8, 1923. Patentee: William E. Beatty, Bayside, N. Y.

THIS invention relates to carrier wave signaling in which messages are transmitted as modulations of a carrier wave.

An object of the invention is to transmit the modulated carrier wave in such a form that it will be unintelligible unless received by specially designed apparatus, such as disclosed herein.

When a message in the form of a carrier wave is sent out from a radiating antenna system, this message is liable to be intercepted by any one who has a radio receiving system at his disposal. It was early recognized as being desirable to send a radio message in such a form that it would be unintelligible, or would not be received at all, unless specially designed receiving apparatus were used. Former carrier wave secrecy systems, for the most part, are open to the objection that the specially designed receiving systems include a motor which must be kept in synchronism with a similar motor at the sending station.

Fig. 1.

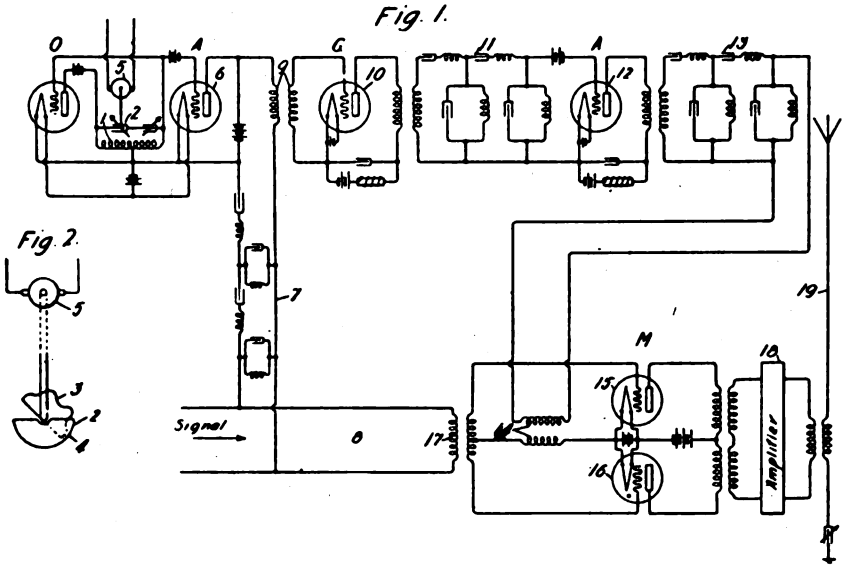


Fig. 2.

William E. Beatty's method of producing modulated signals which cannot be received except on specially designed receivers. He accomplishes it by the use of a pure modulated wave component having side frequency previously determined. A mechanical means is also used which consists of the rotation of a specially designed condenser at certain speeds.

This objection is not applicable to the present invention, according to which a method of and means for secret signaling are provided, in which a proper phase relation between the currents at the sending and receiving stations is maintained without the use of synchronously driven moving parts.

In order to get the modulated wave into a form that cannot be handled by ordinary receiving apparatus, advantage is taken of a previously proposed scheme, according to which the unmodulated components having carrier frequency p may be suppressed, so that a pure modulated component having only the side frequencies $p+a$ and $p-a$ may be transmitted. In this case a is the instantaneous frequency of the modulating currents. If only the side frequencies $p+a$ and $p-a$ are transmitted, this gives an element of secrecy, as this message is unintelligible unless combined at the receiving station with locally generated oscillations of frequency p. In a manner analogous to the production of beats in sound waves, the combination of currents of frequency p with currents of frequency $p+a$ for instance, gives the difference frequency a corresponding to the signal which was sent.

According to the present invention the unmodulated currents are likewise suppressed, so that only the side frequency $p+a$ or $p-a$ or both are transmitted. Instead of keeping the carrier frequency p constant, however, as previously proposed, the present invention provides for continually changing the value of the carrier frequency p while signals are being sent.

If in this case an intercepter attempts to get the message by combining the received waves with the locally generated oscillations of a constant frequency, he will hear in the receiver a noise produced by currents having a varying frequency equal to the difference between the frequency of the locally generated oscillations and the frequency of the side band $p+a$ or $p-a$, where p is continually changing. Currents of this character give rise to a siren effect in the receiver and the signal is not intelligible. The value of the carrier frequency p transmitted is varied rapidly and in an irregular manner, so that an intercepter would be confronted with the problem of similarly varying the frequency of the locally generated oscillations before the received message wave could be rendered intelligible.

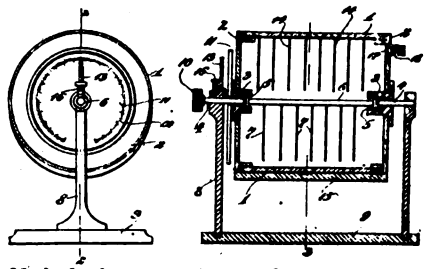
The manner in which the present invention provides for varying the locally generated oscillations at the receiving station in the same manner as the frequency of the carrier oscillations at the sending station, without the use of synchronous motors, will be described in connection with the drawings in which:

Fig. 1 illustrates a radio signaling station; Fig. 2 discloses the motor-driven condenser blade, having an irregular shape, that may be used in connection with an oscillator to provide a carrier frequency which varies in an irregular manner.

Electrical Condenser

No. 1,452,610: Patented April 24, 1923. Patentee: Morris Kloaner, New York, N. Y.

THIS invention relates to electrical condensers, and has for an object the provision of an apparatus of this character which is of continuously variable capacity whereby the tension may be varied to meet numerous requirements; a further object being to provide an apparatus which is of such air-tight construction as to be capable of containing either compressed air or any adaptable gas capable of being used in electrical condensers.



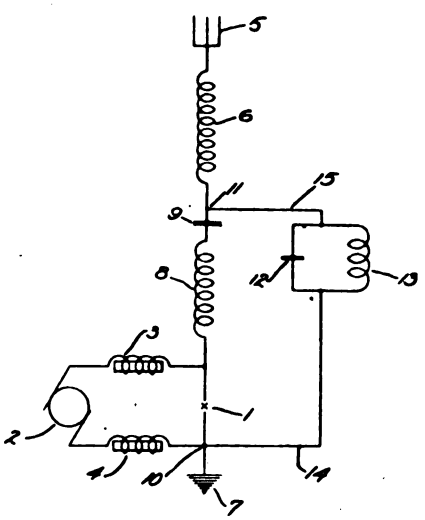
Method of constructing condenser to allow continuous variation and also to allow the use of gas or compressed air as a dielectric.

The above named and other objects are attained by employing improvements which comprise a set of stationary metal leaves or plates, and a set of adjacent turnably adjustable plates adapted to either partly or completely interleave therewith, casing means for enclosing said sets, means for mounting the parts, means for rotating the adjustable plates, and various other nover features, all as hereinafter fully described and specifically set forth in the annexed claims.

Radio Frequency Transmission System

No. 1,454,652: Patented May 8, 1923. Patentee: Haraden Pratt, San Francisco, Calif.

MY invention relates to a radio frequency transmission system, and more particularly to a system embodying a source of high frequency oscillations, such as a Poulsen arc, which may under certain conditions produce objectionable higher harmonic oscillations. These higher harmonics not only produce an energy loss, but they also present a problem of interference with stations tuned near the



Method of suppressing harmonics in arc or long wave transmission.

frequencies of the higher harmonics. As the number of stations increase, this interference becomes more and more objectionable, and it becomes not only advantageous to suppress the higher harmonics, but almost imperative to do so. One of the objects of my invention is to make it possible to suppress substantially all of the higher harmonics by means of a simple and inexpensive arrangement.

Answers to Readers of Radio World

Is there any difference in the hooking up of the U. V. 201A tubes and the regular 200 or 201? Are these tubes any louder? Will I have to use any special type of transformer? I am using the Acme Audio and General now. Will they work with these tubes?—H. Smith, Oswego, N. Y.

No. You can use the same hook-up for these tubes as for any other three element tubes. They are improved tubes which have certain advantages over the regular U. V. They are slightly better amplifiers than detectors but can be used as both. You can use any type of transformer that you are at present using with the other tubes. The transformers you are now using will function with these new tubes.

* * *

Where can I obtain the circuit diagram of the Mawhinney circuit, described in RADIO WORLD*?—A. L. Feldman, Red Bay, Alabama.*

Write to A. S. Mawhinney, 801 Riverside Drive, New York City, and he will advise you as to the cost of the blueprints.

* * *

Advise me if the coil for the Reinartz circuit described in RADIO WORLD *for Jan. 13 will allow me to hear the new stations operating on waves up to 500 meters?—Walter W. Ott, 45 Elmwood Ave., Irvington, N. J.*

With proper manipulation of the controls of this set you should be enabled to take all waves up to 550 meters.

* * *

What is the receiving range of the combined transmitting and receiving set described in RADIO WORLD *for May 19 by Carl Masson? My antenna is 150 feet long and 50 feet high. Would this aerial be satisfactory for transmitting? Would a shorter aerial be better? Where would a key be inserted to enable me to send code? What would be my range with code? Will using a five watt transmitting tube increase the range of the set?—Jack Fry, 1080 Pearl Street, Denver, Colo.*

As we have stated many times before, it is impossible to even estimate the receiving range of any receiver. The only way in which you can determine that is to build the receiver and try it out. Your antenna is too long for transmitting—100 ft. is about the proper length. Insert your key in the grid circuit. You will have to do two things to accommodate this set to code work. Obtain a key which can be closed (an ordinary line telegraph key with closed circuit switch will do), and also provide some means of shortening the microphone. See answer to your first question. The use of a five watt power tube will increase the range of your transmitter and will allow you to use more B battery, which will make your set more powerful.

* * *

Please tell me where I can get something that will prevent interference between stations.—L. Fitch, Springville, Tenn.

The easiest and best manner to cut out interference between stations is known as a filter circuit. Numerous filters have been explained from time to time in RADIO WORLD. We refer you to RADIO WORLD for January 20, or April 21. A filter consists of a set inductance in parallel with a capacitance connected in the antenna circuit. This circuit is tuned to the interfering wave, and the receiver is tuned to the wave desired. A wave trap, or filter, will not allow you to eliminate interference if both stations are on the same wave. Only stations on other waves which interfere, due to being powerful, can be filtered.

* * *

I have built a reflex circuit and want to know if it is possible to add another step of audio-frequency to it. Is it good policy to wind the primary and secondary of a coupler with the same size wire?—Jos. L. Reisler, 7736 Phelps Ave., Detroit, Mich.

It is possible to do as you suggest but if you are going to use another tube why not make it additional radio and audio, and gain the advantage of two steps instead of one? This will only necessitate the use of an additional radio frequency transformer in connection with the audio transformer that you will have to use. Yes, it is good policy to wind both stator and rotor with the same size wire.

* * *

What is the wave length of the Stockelberg "Pup" set?—H. H. Courtwright, 4119½ Bryan Street, Dallas, Texas.

Because of the fact that honeycomb coils are used in this circuit the wave length of this set is anything from 200 to 20,000 meters, depending upon the honeycomb coil you use.

* * *

What is the address of R. W. E. Decker, who recently had an article in RADIO WORLD *on a C. W. Transmitter?—Rev. Fr. Romuald Fox, O.S.B., Immaculate Conception Church, Valley Falls, Kansas.*

Mr. Decker's address is 834 Riverside Drive, New York City.

* * *

I have constructed the Turnbull set described on page 5 of RADIO WORLD *for May 26 and followed your instructions as closely as possible but it does not work right. I can get local stations but no distance. I am using the best apparatus and all my connections are soldered, but the tube will not oscillate.—Dr. E. S. Mayhew, 8524 Quincy Street, Detroit, Mich.*

Examine your antenna and ground leads and wires. Then, if there is no bad connection, make sure of your connections on your variometer. If the ground-filament wire is not connected at the joining of the two windings of the variometer the circuit will not function properly, and this is probably your trouble. Go over your connections very carefully, as too much care cannot be taken in making right connections and the slightest mistake will cause you trouble.

* * *

In RADIO WORLD *for March 17 you describe a one-tube super loop receiver by W. S. Thompson. Can this set be used with a WD-11 tube? If not, what tube would you suggest?—H. L. Thomson, 1130 Fifteenth Street, Moline, Ill.*

It is not advisable to use this tube in the set you mention. The circuit calls for a hard tube and also needs a tube with a greater plate and grid surface than the WD-11 tube possesses. The U. V. 201A tube could be used for this purpose if you want one which does not necessitate a storage battery.

* * *

How should I count the turns for the tapping of the honeycomb coil for the Pup set, described by R. L. Dougherty in the May 5 issue of RADIO WORLD*?—R. K. Hiner, RFD 5, Box 75, Rogers, Ark.*

The tap should be taken off from the inside turns, counting in the direction in which the wire is run. As every turn in a honeycomb coil comes out as a loop, it is only necessary to begin at the end of the wire and count the loops around the inside circle as the wire is wound.

* * *

Will the set described by Arthur S. Gordon in RADIO WORLD *for April 14 work on a loop? If it will not, what is the next best thing to use it with? I cannot erect an outside antenna because of the landlord's objections. Will it work on a ground alone? Will it work on an antenna alone? How is the set operated?—T. F. Miller, 47 Hikes Street, rooklyn, N. Y.*

You can accommodate this apparatus to a loop. By the use of the apparatus shown in the circuit you mention an outside antenna is rendered unnecessary, although with the circuit you will have to use a ground. The circuit referred to will be found on page 5 of RADIO WORLD for March 17, 1923. The aritcle in question was written by Arthur G. Shirt and shows a method by which you can very easily accommodate your present set to a loop. A wire strung around a picture moulding will also serve as an antenna, although there is a chance that the metallic structure of the building will lessen your distance due to absorption. Any circuit can be used for local work up to a distance of five or 10 miles by simply using a ground, and this is especially true with single circuit receivers. The set should be operated in the following manner: The tubes should be lighted, after making sure of all your connections, and the taps on the primary of the variocoupler should be varied, at the same time loosening and tightening the coupling of the tickler. A high scream will be heard, which will vary from a very high pitch to low, and then as the tickler is moved, it will again rise from low to high. It is at the dead center of these two carriers that you will hear the voice or music. You will have to determine the point on the primary and the setting of the condenser for each wave length for yourself, as no set point can be given for any wave length. If, when the station is tuned in the voice is muffled and comes in thickly, that is an indication of too much A battery and the filament should be turned down slightly until the voice comes in clearly, and then the vernier of the rheostat brought in until the set is just beyond the point at which the tube will "spill." It is at this point that the set is working the best and the best reception will be had.

How It Sometimes Happens

THE young radio wizard of the family arrives home from business, parks his hat on the first convenient hook, dashes into the "radio room," puts on the phones and turns up the bulbs—but no juice! He fiddles around a few seconds, and then—a sudden inspiration—with rapidly beating heart and shaking hands he takes out a tube. Wow! Every one of them gone—done gone galley west—burnt out!

Silence! Then with trembling lips and rising temperature he yells: "Say, who was fooling around this set of mine? Who burnt out my tubes? Hey, ma! One of those kids was foolin' around in here after I told them to keep out and now my tubes are all gone. Gee, a fella can't keep anything around this old house with those doggone kids foolin' around."

"Now, son, I told Junior that he could listen in and he just played around in there a little while. Maybe they just went out of their own accord. Don't you dare touch him, or I'll tell pa to throw that noisy thing out!"

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Seamen's Rights to Medical Radio Service

THE probability that some masters of sea-going vessels may not, as yet, heve been fully informed in regard to the right of members of their crews to medical service by radio while at sea and to treatment in U. S. Public Health Serice hospivtals on reaching port has caused Surgeon General H. S. Cumming to direct the preparation and sending of posters giving full information to all vessels of the American Merchant Marine.

Curiously enough, this medical service is really a sort of sudsidy to merchant ships and sailors. A century and a quarter ago, when Congress established the Public Health Service, under the title of the Marine Hospital Service, it directed it to render medical aid to every American seaman who applied for it; and that for this each seaman should pay 20 cents a month. This was in 1798. In 1870 the tax was doubled; but in 1888 it was abolished, and since then all such aid has been rendered free. Even the expense of calling the Service by radio from away out at sea is borne by the radio companies without expense to ship or sailor. The forthcoming poster announcement reads:

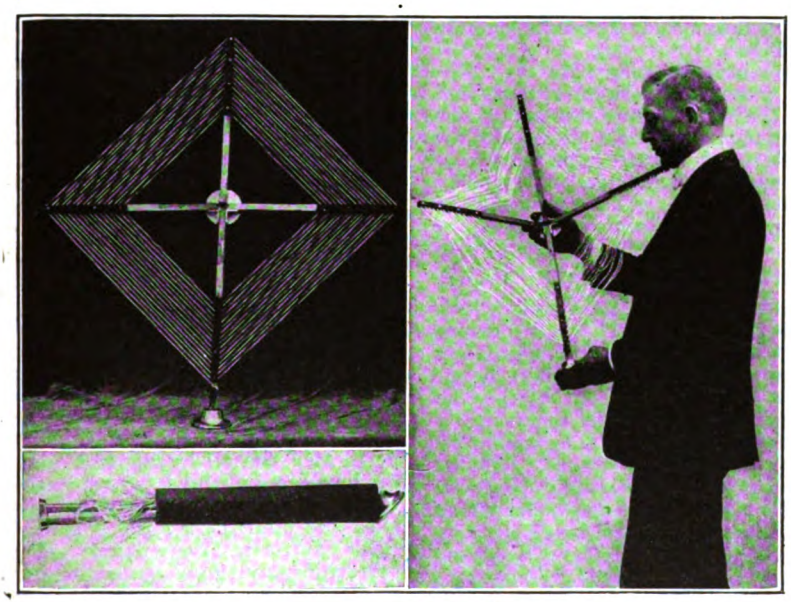
"The U. S. Public Health Service provides hospital care and outpatient treatment for sick and disabled seamen. Hospitals, specialists, dentists and other facilities are open to all persons employed on documented American vessels, and to the Coast Guard, lighthouse keepers, and certain others who help to keep the flag on the seas. An ambulance will go to the dock at any time upon telephonic call from a ship's officer.

"As you are proud of a good ship, take pride also in keeping your own body healthy. Most injuries are due to carelessness. Most diseases can be prevented. Prompt care of small injuries may save a limb. Early treatment for disease may save a life or prevent months of illness. Learn to keep well. Pamphlets on tuberculosis, venereal disease, and other common diseases are sent on request by the Surgeon-General, U. S. Public Health Service, Washington, D. C. A book, 'The Ship's Medicine Chest and First Aid at Sea,' will be sent on request to the master of the vessel. Any Marine Hospital will prescribe emergency treatment through radio shore stations."

A New Collapsible Loop Antenna

ALMOST practical, compact and easily portable loop antenna has been invented and patented by Mr. J. Nazeley, Palisade, N. J.

The "Portena" when extended has a measurement of 27 inches; but, by its ingenious folding design, it is inserted in a rigid tube 16½ inches long, the two ends of which are sealed by the center flange, and the case is ready to be shipped conveniently anywhere. The construction of the "Portena" is somewhat different from the loops now on the market. The four folding arms are made of maple, mahogany finish, ½ inch square, and hinged by rivets to channeled flanges on a central non-magnetic disc. Each arm carries two XX Bakelite strips, between which the turns of wire are held securely in slots. There are in all 16 turns of wire comprising the winding. The wire used is special and double insulated, and composed of 60 No. 38 copper and five No. 36 strands of phosphor bronze to obtain the maximum flexibility and to insure against stretching when often manipulated.



The "Portena" Collapsible Loop Antenna

The inventor of this portable loop, which he has named "Portena," for many years has done research work in the electrical and radio field. He is demonstrating that his loop, although it is only 15 turns of wire on four folding arms 13½ inches long, has successfully operated on receiving sets having two or more stages of radio-frequency for DX work or one stage of radio-frequency for local work.

In the illustration herewith the three positions of this new loop antenna can clearly be seen extended, folded and inserted in its carrying container.

Although this portable loop weighs less than 2½ pounds it is very rigid, being constructed to withstand abuses of the trail when carried to camps, automobiling, etc.

Why Magnavox *is* the Reproducer Supreme

OFFICIAL tests with the oscillograph prove that the Magnavox electro-dynamic receiver reproduces incoming wave forms with maximum accuracy.

The Magnavox can be used with any receiving set—the better the set, the more Magnavox can do for you.

When you purchase a Magnavox you possess an instrument of the very highest quality and efficiency.

R2 Magnavox Reproducer with 18-inch horn (as illustrated)

This instrument is intended for those who wish the utmost in amplifying power. It requires only .6 of an ampere for the field.

Price, $60.00

R3 Magnavox Reproducer with 14-inch horn

The ideal instrument for use in homes, offices, amateur stations, etc. Same in principle and construction as Type R2. Price, $35.00

Model C Magnavox Power Amplifier

For use with the Magnavox Reproducer and insures getting the largest possible power input.

2-stage, $55.00
3-stage, $75.00

Magnavox products can be had of good dealers everywhere.

THE MAGNAVOX CO.
Oakland, California
N. Y. Office: 370 Seventh Ave.

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"Character, industry and thrift are of primary importance, integrity is a fundamental element in wholesome growth, sham is waste, and there is no real success without sincere service."—Strawbridge & Clothier, Philadelphia.

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. *Telephone Bryant 4796*

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Radio Lyre Co., 413-14 New Nelson Building, Kansas City, Mo. (Distributor, particularly to foreign-born population.)
Heilman's Electrical Shop, East Lake Station, Birmingham, Ala.
Marion Brown, 1107 West Sycamore Street, Independence, Kans.
O. A. Kenyon, 111 Broadway, New York City.
R. Nairn, General Delivery, Kamloofis, B. C., Canada.
Lester Hayne, Milverton, Ont., Canada.
Alphy Blais, 25 D'Aiguillon Street, Quebec City, Canada. (Will soon open radio store.)
O. V. Rzehak, 1146 San Julian Street, Los Angeles, Calif.
Edward V. Archer, 1402 Olivia Street, Key West, Fla.
A. E. Baldwin, Switchboard Supervisor, Chenango & Unadilla Telpehone Corporation, Norwich, N. Y.
Whitman Radio Service, 176 Monroe Street, Brooklyn, N. Y. (Build receiving sets with standard parts.)
Walter Mohr, Witherton, Ontario, Canada.
Wm. Wachsman, 120 West 117th Street, New York City.
John N. Schmitz, Box 272, Albion, Nebr.
Richard M. Melcher, 185 Main Street, Brunswick, Me.
Jack Gordon, Belmont Supply Co., 468 Springfield Avenue, Newark, N. J.
W. B. Speirs, 4102 Buchanan Street, Detroit, Mich.
H. B. Lynch, Windsor, Mo. (Dealer.)
Leo V. Brains, Carlisle, Ark. (Retailer.)
E. L. Kemp, Brandon, Vt.
The Parker Roll & Record Co., Lexington, Ky.
V. G. Bidwell, Healdton Electric Supply Co., Healdton, Okla.
C. F. Clark, Wall, South Dakota.
Robert Fisher, 116 Park Street, Burlington, Vt.
Anthony Sini, P. O. Box 123, Shoreham, Long Island, N. Y.
Calvin E. Church, 1202 Castle Hill Avenue, New York City.
L. W. Hunt, 324 West Second Street, Ottumwa, Iowa.
Frank J. Morrison, Box 223, State College, New Mexico.
Lewis R. Twitchell, 302 Northwest 22nd St., Miami, Fla. (Wants information on a long-distance broadcasting station.)
A. J. Bryant, 506 North Lake St., Urbana, Ill.
O. C. Miller, Atchison, Kans.
Blas Rocafort, Lealtad and Malecon Sts., Havana, Cuba. (Consumer.)
F. D. Rohrback, P. O. Box 45, El Reno, Okla. (Dealer and repairs.)
John Nelson, Lincoln Park, N. J.
A. V. Jacobson, Box 496, Venango, Neb.
Emery S. Dennis, 1703 Crilly Court, Apt. 4, Chicago, Ill.
John J. Kenna, Woodbridge Ave., Port Reading, N. J. (Interested in dry cell receivers.)
W. I. Bartlett, Atlanta, Mo. (Interested in experimental equipment.)
Walter V. Frabell, 3602 Wood St., Wheeling, W. Va.
Chas. Ebert, 48 Wycoff Ave., Brooklyn, N. Y.
Frank Ebert, 794 Flushing Ave., Brooklyn, N. Y.
A. E. Searing, 1213 Gray Ave., Utica, N. Y. (Wants to buy set.)
V. A. Charles, 107 Massachusetts Ave., Boston, Mass. (Will open retail business in September.
A. B. Miles, Library, Walter Reed General Hospital, Washington, D. C.
B. F. Bianchi, Sabael, Staten Island, N. Y.
C. B. Millar, Reward, Calif.
Jack Brothers, R. F. D. 3, Kosse, Tex.
A. F. Williams, 1001 Franklin St., San Francisco, Calif.
General Radio Company, 122 Fifth Ave., New York City.

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for $1.00. Radio World, 1493 Broadway, N. Y.

The New Grebe CR-12 Receiver

IN the new Grebe receiver, the CR-12, is employed radio frequency and regeneration, the two factors most important in long distance reception. One of the distinctive features claimed by the manufacturers of this Grebe product, is the simple manner in which it may be used with any tubes now on the market. A 201A may be used in the radio frequency circuit and a WD-11 as a detector, a UV-199 in the first stage of audio-frequency amplification and a UV-200 in the second stage audio-frequency amplification. Such combinations may be used with either dry cells or a six volt storage battery. With no combination of tubes is more than one A battery necessary.

This receiver has but two tuning controls, one of which is calibrated to wave lengths, thus reducing to a minimum the elements of chance in tuning for a given station. With a wave length of 200 to 600 meters, the set will receive all wave lengths which have come into effect since May 15th. No outdoor antenna is used, in fact the antenna is supplied with the set, and consists of a silk covered wire 20 feet in length. This wire, although not unsightly, may be hidden back of a picture moulding or run along the base board.

Telephone jack and plug have been provided for those who wish to receive with telephone headset, and the insertion of the plug in the jack automatically disconnects the loud speaker and transfers the signals to the telephones. This new receiver is readily transportable, as it is, with the exception of the loud speaker, self-contained.

Compact Variable Grid Leak

A NEW type variable grid leak, which has been developed in the laboratory of the New York Coil Company after satisfactory tests, is now being manufactured in quantity for distribution. The attractive feature claimed by the company is that variation of any value from zero to 5 megohms can be secured without opening the circuit. This is possible through the arrangement of a roller which traverses a permanent resistance element. The instrument is compact and neat, and material and workmanship are consistent with the New York Coil quality. Literature describing the variable grid leak and other new products manufactured by the company will be mailed upon request by the New York Coil Company, 308 Pearl Street, New York City.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

PACIFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Calif., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Calif.

CANADIAN ELECTRICAL ASSOCIATION, Montreal, Canada, June 21-23, 1923; Louis Kon, secretary, 65 McGill College Avenue, Montreal, Canada.

A New Crystal Detector

A NEW crystal detector resembling a three element tube, made by the Burke Manufacturing Company, 94 Academy Street, Newark, N. J., should prove of great interest to owners of tube sets. The device resembles the new small 1½-volt tubes both in appearance and in the manner in which it is used. It is constructed to fit into the regulation six-volt socket and the crystal detector is sealed in the vacuum chamber of the tube. Inasmuch as crystal detectors need adjustment, provision has been made for the adjustment of this detector by lightly tapping on the side of the glass tube. This causes the catwhisker, which is a light spiral spring, to move over the surface of the crystal, and as a synthetic crystal is used which is equally sensitive over a large surface it is not hard to find a sensitive spot. The method of use of this detector is as follows: The regular detector tube is removed from the socket and the filament and battery removed and the leads shorted and grid leak short circuited, and the tube crystal is inserted in the regulation manner. Then the tube is lightly tapped and upon the turning of the controls the signals are heard.

This detector should fill a long felt want in the set of the amateur who wanted to use crystal detectors in his set for local work, but who did not feel like reconstructing his set to accommodate such a change. It is very neatly and carefully made and is an instrument that due to its particularly close resemblance to a tube detector, will not disfigure the best looking set, as no extra leads or unsightly wires are used for its connection.

A New Anti-Capacity Panel

THE Radio Panel & Parts Company claim excellent qualities for a new shielded anti-capacity panel for which they are distributors. This is a well finished hard rubber product shielded with perforated tin-foil by a patented process of manufacture and is so made that sections of the shielding may be lifted out with the point of a knife. It is claimed this anti-capacity panel eliminates screeching and howling due to body capacity. All standard sizes will be stocked and special sizes cut to order. Information may be obtained from Radio Panel & Parts Company, 70 Murray Street, New York City.

New Radio and Electric Firms

Nolte Mfg. Co., 61 Gautier Ave., Jersey City, N. J., to manufacture Reinartz coils.

T. R. Huber Electric Co., Rochester, N. Y., contracting, etc., $75,000; T. R. and E. A. Huber, A. B. Green. (Attorney, F. J. Mix, Rochester, N. Y.)

Syracuse Lighting Co., Syracuse, N. Y., has increased its capital stock from $6,000,000 to $20,000,000.

Combination Electric Switch Corp., New York City, $100,000; N. B. Gurock, C. Pincus. (Attorney, P. A. Zizelman, 42 Broadway.)

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New DX Night Owl Records That Count

Fair to Middlin', Eh?

From Burdette M. Smith, R. L., Box 48, Le Mars, Ia.

I HAVE read a great number of the letters and records sent in to your DX Nite Owls Department and as mine is somewhat better than some I have seen and also not as good as some I have seen, I'll admit, nevertheless, I think it is a pretty fair one. Up to and including May 15th, I have heard one hundred eighty-eight (188) stations using phone. Of this number fifteen are amateur stations worked on or around 200 meters when they were using phone.

Following is the list of stations by states:

Alabama	1	New Mexico	2
Arizona	1	New York	7
Arkansas	2	N. Carolina	1
California	6	N. Dakota	1
Colorado	5	Ohio	7
Georgia	3	Oklahoma	6
Idaho	1	Oregon	1
Illinois	10	Pennsylvania	8
Indiana	2	S. Dakota	5
Iowa	13	Tennessee	4
Kansas	6	Texas	14
Kentucky	3	Utah	2
Louisiana	5	Virginia	1
Massachusetts	2	Washington	1
Michigan	3	Wisconsin	5
Minnesota	10	Wyoming	1
Missouri	8	Porto Rico	1
Montana	1	Canada	6
Nebraska	12	Cuba	2
New Jersey	3		

I wish to state here that this list of stations have been positively identified as to call letter and location before it was logged and this list has been recorded since November 1, 1922. All of these stations were received QSA on det. and one stage A. F. with the exception of WKAQ, San Juan, Porto Rico. I have heard twenty-seven stations over 1,000 miles away and every Class B station but one.

I wish also to submit the following list of stations received on Wednesday, April 18, from 8:15 P. M. to 11:45 P. M. All received on det. and 1 step:

WOC	—Davenport, Ia.
WAAW	—Omaha, Nebr.
WOI	—Ames, Ia.
WIAH	—Newton, Ia.
KYW	—Chicago, Ill.
WDAF	—Kansas City, Mo.
WHAS	—Louisville, Ky.
WEAB	—Ft.. Dodge, Ia.
WOS	—Jefferson City, Mo.
WHAD	—Milwaukee, Wisc.
KFDY	—Brookings, S. D.
WGV	—New Orleans, La.
KDKA	—E. Pittsburgh, Pa.
WLAG	—Minneapolis, Minn.
WEAH	—Wichita, Kansas.

THE editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

WLW	—Cincinnati, Ohio.
KFDU	—Lincoln, Nebr.
WJZ	—Newark, N. J.
KDYS	—Great Falls, Mont.
WCAE	—Pittsburgh, Pa.
KSD	—St. Louis, Mo.
WBAP	—Ft. Worth, Texas.
CFCN	—Calgary, Canada.
5KW	—Tuinucu, Cuba.
KPO	—San Francisco, Cal.
CFCA	—Toronto, Canada.
WMC	—Memphis, Tenn.
CHBC	—Calgary, Canada.
KFAE	—Pullman, Wash.
WMAQ	—Chicago, Ill.
KHJ	—Los Angeles, Cal.
WSB	—Atlanta, Ga.
KFDB	—San Francisco, Cal.
KFFQ	—Colorado Springs, Colo.
KWH	—Los Angeles, Cal.
WRAL	—St. Croix Falls, Wisc.
WDAJ	—College Park, Ga.

I have a Grebe CR 9 and for concert work for the neighbors and the family, use a Magnavox 2 stage power amplifier and Magnavox loudspeaker. I obtain enough volume to entertain neighbors over a mile away on still evenings, using UV 201 A tubes in set and power amplifier with 113 volts on plates of tubes in power amplifier. I have a .005 mfd. condenser across the input terminals of my Magnavox which helps greatly to clear up reception when using extreme amplification.

I am going to sign off here and if anyone cares to write me concerning further information regarding my set and my equipment, I will be glad to answer their inquiry. I am building a three stage R. F. amp. and det. and expect to make some better records than these.

A Little More from N. S.

From A. D. Turnbull, 57 Union St., Sydney, Nova Scotia

With single circuit regenerative using one R215A dry cell tube I can hear whenever they are going CFCF, CKAC, WGI, WBZ, WNAC, WMAF, WGY, WHAZ, WOR, NAA, WEAF, WAAF, KYW, 1OAA, 1AA (Canadian), KDKA, WIP, WFI, WAO.

On several occasions, using one stage peanut tube, I've heard CJCI, WOC, WFAA, PWX, WSB, WHB, WLW, WBAP, WPA, WDT, WVP, KDOW, WDY and QXJ.

Not bad for away up here. With one stage on fair evenings WGY is heard 25 feet from phones. Home-made set. This R215A is a Canadian tube, Northern Electric, and takes 22½ on plate, 1½ on filament. Excellent for detector or radio frequency work and gives great audibility on low-frequency.

Nothing Like Trying—to Beat This

From Wilbur Craig, McLean, Illinois.

I GET the RADIO WORLD every week and I am interested in the DX Nite Owls' records. Some of the records are good, some aren't quite so good.

I have had a one tube three circuit set since September. I have heard 217 stations, the list only shows 210, but as there were seven that I wasn't sure of I did not send them in. The most stations I ever heard in one night was 39.

March 10th I received WJZ, PWX, CFCN, KHJ, KFI and KGW. Five stations, all over 1,000 miles distant. I have heard both coasts, Cuba and Canada all in one night quite often. I am not saying that there are not better one tube records but I am fully satisfied. I have a three wire aerial 45 feet long, 25 feet high and in among trees.

WHB, KFAF, WAAC, 9XZ, WPAD, WWJ, 2XI, WIAO, WGAX, WBT, WGM, KDKA, WNAL, WEAK, KNJ*, WCX, WAAK, WJAN, WEAF, WJAX, WCK, WBAE, WCAT, WOAA, WCAS, WSB, WBAP, WCAB, WAAP, KHJ*, WOC, WCAP, WGAF, WQAQ, WIAQ, WKY, WCAZ, WLAL, WCM, 9AMI, WLK, WDAF, WIAR, WCD, WEAO, WPA, WDAJ, WFAC, WWI, 5XJ, WRM, WEAB, WNAD, WOAN, WGR, WLW, WFAA, WKAK, WMH, WMC, WBL, WAAF, CJCG, WJAP, WIP, WGY, WFAP, CFCA, WGAZ, WFI, WOR, WHAS, WCAF, 5YU, CKCK*, WJZ, WMAQ, WBZ, WOAZ, WOI, WGF, WDAP, WKAL, 5YQ*, KOP, WOS, WDAC, WCAF, WEAH, 9ZV, WSY, WMAC, WHAM, PWX*, WGV, WHK, WFAB, WQAA, WKAA, WDAO, WMH, WFAV, XIAZ, WLAJ, WHAP, KSD, WNAV, 9CPM, WCAJ, WSA, WDZ, CFAC*, CHBC*, WFAT, WLAK, WCAL, 9YF, 9DIL, WJAZ, WLAZ, WOQ, WHAB, WAAL, 8XJ, WSAT, 9DWG, WJAL, WJD, WMC, WPAL, WPAC, WCAY, KFFQ, WRK, WQAL, WNAR, WGAS, WFAZ, 6KW*, 9CLS, WNAT, KGW*, WEAY, WJAF, KXY, WHA, 9XM, WJAD, WBAA, WJAJ, WRR, CFCN*, WHAD, WSAH, WPAH, WCAM, 9DXD, 4XJ, WAAX, 9AWK, WOAX, WGI, WWAY, WBAH, WJYT, WDS, WHAX, WOAW, WEB, 9AWA, WJAS, KFDV, 9CCV, WHAS, WMAV, WSAJ, WIAS, KFDL, KFCL*, WIAE, 9UH, 9AWJ, WOAL, WWAD, CKCZ, KWH*, CFCF, WTAW, WMAK, WOAI, WEV, KFEL, WLAC, WWB, WDAL, WMAY, WTAS, KFEP, WDAE, WPAL, CAY, WDAR, WQAV.

*Indicates those over 1,000 miles.

Pittsburgh Church Unveils Tablet Given by Radio Congregation

Episcopal Churches all over the country on June 3 made the announcement that a bronze tablet, probably the most unique in the world, contributed by and dedicated to the unseen radio congregation of Calvary Church, Pittsburgh, Pa., was unveiled during the church services that night.

The Rev. Edwin J. Van Etten, pastor of the church, who was the first minister in the world to have his services broadcast; Bishop Alexander Mann, of the Pittsburg Episcopal diocese; H. P. Davis, "father of radio broadcasting," representing Station KDKA, of the Westinghouse Electric & Manufacturing Company, which station first broadcast the church services; and other prominent Pittsburghers took part in the ceremony.

More than 4,700 people representing 40 states of the Union, five provinces of Canada, Cuba and Bermuda, London, England, even sailors from ships sailing the Atlantic Ocean contributed to the purchase of the tablet. The contributions came in every form of legal tender—silver dimes, stamps, nickles, pennies and checks. There were a surprising number of Canadian dimes. A worker in the Southern cotton mill sent Dr. Van Etten two cotton socks with a nickels, pennies and checks. There were on the Atlantic sent the minister 120 pennies he had won playing penny ante.

These contributions came as a result of Rev. Van Etten's idea that his radio congregation to which he had been preaching since January 2, 1921, might like to contribute to some sort of memorial. Accordingly, during the reading of his regular church announcements Dr. Van Etten addressed, directly, his unseen hearers and told them of a plan to have small contributions from such of them as might like to participate. The sum obtained from the contributions was to be used for a memorial dedicated to them.

Responses to this idea were almost instantaneous. An hour after the announcement was broadcast contributions were received.

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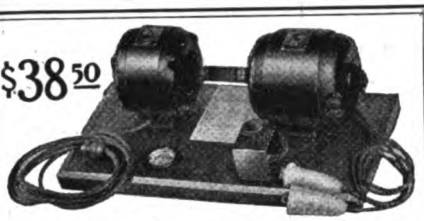


$38.50

RECHARGE YOUR OWN BATTERIES

WHY pay out good money constantly for recharging batteries when the Ohio Motor Generator will do it quickly at a slight expense. This inexpensive home charging outfit keeps your Radio in service all the time and pays for itself—by charging your neighbors' batteries. It is noiseless, gives no trouble, and will even recharge totally exhausted batteries quickly.
The set is made up of the celebrated Ohio A C motor and D C generator wound for 6-10 volts. The motor and generator have ball bearings and are of the highest grade construction. It has none of the troubles common to cheap charging sets and will last a lifetime. It will charge quickly any three cell automobile or Radio "A" battery. Furnished complete on a substantial base with ammeter and field rheostat to adjust the charging rate from one to twenty amperes. The motor is for 60 cycle, 110 volt service and is complete with ten foot cord and attachment plug ready for instant connection and operation. Full instructions provided.
Motor and generator can be specially wound to charge six cell batteries or other unusual conditions.
Price $38.50 f. o. b. Cleveland. Ship by Express C. O. D., weight sixty pounds. Send your order today and stop paying good money for recharging. Your money back quick if not satisfactory.
NOTE:—If your service is other than 60 cycle, 110 volt, ask for special price.
THE OHIO ELEC. & CONTROLLER CO.
CLEVELAND OHIO

YOU SAVE 50% OF THE USUAL COST

WORLD BATTERIES FOR RADIO

6 Volt 60 Amps.	$10.00
6 Volt 80 Amps.	12.50
6 Volt 100 Amps.	14.50
6 Volt 120 Amps.	16.00

A Better Battery Cannot Be Built

The best of material—careful construction by skilled mechanics—makes a battery that will give a long life of hard service.

A written two (2) year guarantee. You take no chances with a World Battery—it is the most satisfactory battery you can get and you save 50%.

Mail Your Order Today

We ship C. O. D. subject to inspection, or will allow 5% discount for cash with order. All orders shipped same day as received.

WORLD BATTERY CO.
Dept. 17, 1219 So. Wabash Ave.
Chicago, Ill.

GUARANTEED 2 YEARS

Build Your Own
HAZELTINE
NEUTRODYNE
with
FREED-EISEMANN
Licensed Essential Parts

Complete wiring diagram, instructions, etc. sent in special container with patented essential parts. Three NEUTROFORMER COILS mounted on variable condensers, and DOUBLE NEUTRODON (as illustrated), sent for **$21.50.** Ask your dealer to show you these parts, as well as complete assembled five-tube Neutrodyne Set in mahogany cabinet, Model NR-5, **$150.**

Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

FREED-EISEMANN RADIO CORPORATION
253 Fourth Avenue New York
Licensed by I. R. M. Inc. Under Hazeltine Patents

Treat Your Radio Phones As You Do Your Watch

ONE of the essential parts of a radiophone receiving outfit is a good pair of telephone receivers, or a 'double head-set,' as they are sometimes called," said an official of Station WOC, owned and operated by The Palmer School of Chiropractic, at Davenport, Iowa, when asked about the operation and care of the telephone receiver. He continued: "On account of their connection with the receiving outfit, receivers are naturally subject to more mechanical abuse than any other part of the set. They are passed, as a rule, from person to person during a concert and thrown carelessly on the table afterwards where the cord is usually a convenient length for them to be bumped off onto the floor.

"A telephone receiver, simple in construction as it may seem, is the result of a great deal of experimenting by manufacturers and designers of radio equipment. Each of the two receivers consists of a coil of very fine wire, a permanent magnet and a diaphragm, these parts being housed in the hard rubber case with remarkable care. The size of wire and number of turns in the coil, the thickness of the diaphragm and the magnet and the amount of residual magnetism in the pole pieces are all very delicate factors in the successful operation of a telephone receiver. These factors are carefully tested in the manufacture of these instruments and any tampering with their adjustments usually decreases their efficiency or renders them entirely useless.

"The action that takes place within a receiver is as follows: Feeble electric currents set up in the receiving instrument by incoming signals are passed through the coil of a telephone receiver. This current is rapidly changing in value or fluctuating, which change causes a corresponding change in the degree of magnetism within the pole pieces. The diaphragm being suspended within this rapidly changing magnetic field, records these fluctuations in the form of mechanical vibration, which in turn is reflected to the ear in the form of sound waves. When this delicate function is kept in mind it is easy to understand why more than the average care should be taken in handling these instruments.

"It is well to observe the following rules regarding their use:

"Don't drop the receivers or subject them to a heavy jar in any way. A jar is a very effective means of demagnetizing a permanent magnet.

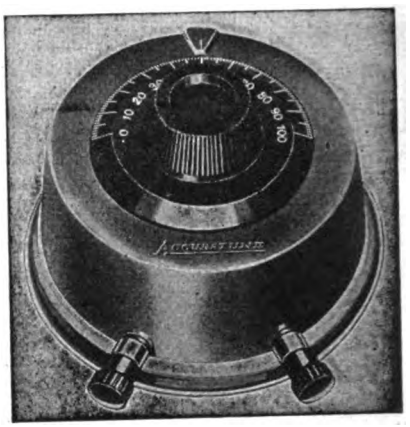
"Don't try to use an ordinary receiver, such as used on your office phone, to receive radio signals. While the principle of operation is the same in both, the receivers designed for radio are many times more delicate and time spent with the former is usually time wasted.

"Never remove the cap from the receivers or look for suspected trouble inside; such cases are very rare, and should they exist, it is not at all likely that you could locate or repair such trouble satisfactorily.

"Do not press upon the metal which you see through the hole in the cap. This diaphragm is made of very thin metal and must be in a perfect plane to vibrate as intended. The slightest dent or bend will ruin a diaphragm.

"It is well to have a convenient hook on which to hang the receivers by the head band when they are not in use. In short, apply the same rules to handling your phones as you do to your watch and they will serve you with equal faithfulness."

AUXILIARY TUNER



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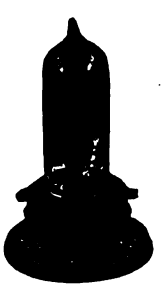

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The Na-ald Special Socket No. 499 is a sturdy little socket with a dependable contact for the G. E. No. 199 dry-cell tube. It has special slot construction, and is moulded of genuine Bakelite. The heat from soldering connections will not affect Na-ald sockets.

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The dual-wipe contact stripe of the Na-ald De Luxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties Na-ald sockets keep plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

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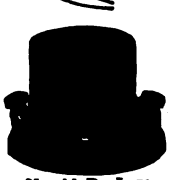

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RADIO WORLD

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

A New Radio Handbook

RADIO will have an important place in the International Aero Exhibition art, by International Correspondence Schools, Scranton, Pa., 564 pp., pocket size, many illustrations, diagrams, tables and data. Price $1.00, postpaid.

This is the latest in the popular handbook series published by the International Correspondence Schools. It was compiled by Harry F. Dart and technically edited by Francis H. Doane, principal of the School of Electrical Engineering. The subject matter is comprehensive, well arranged and efficiently condensed. The book should be of value to all radio amateurs as well as to those professionally engaged in the art.

Radio Section at Gothenburg Fair

RADIO will have an important place in the International Aero Exhibition at Gothenburg, Sweden, during July and August, according to dispatches from Consul Sholes to the Department of Commerce. A special radio section is under preparation, and several foreign and American firms are expected to exhibit apparatus, especially radio sets suitable for interplane and plane to ground communication.

A feature of unusual interest will be the daily receipt of news by radio from the United States for the American visitors at the exposition. Through the co-operation of a Swedish-American News Association and the Naval Communication Service, NAA will broadcast daily five hundred

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WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

CRAM'S RADIO BROADCASTING MAP of the UNITED STATES AND CANADA. Scale 100 miles to the inch. In two colors, size 34x28. Printed on high-grade map paper, up-to-the-minute information, indicating all amateur and standard broadcasting stations, with complete index to stations. 35c postpaid. The Columbia Print, 1493 Broadway, New York City.

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OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

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PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

EXCHANGE JOLLY, INTERESTING LETTERS through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City

RECHARGE dry cell batteries. Cost, 5c. Instructions, 15c. J. Brent, 3 Stueben St., Bridgeport, Conn.

WANTED—Omnigraph in good working condition. Box 435, Hardin, Montana.

DO YOU WANT TO SAVE MONEY in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15c a copy, or start your subscription with this issue. RADIO WORLD, 1493 Broadway, New York.

SAXOPHONE, brass Alto, made by Buffet, Paris, with leather case cost hundred dollars new, both in good condition, WILL TRADE for complete WD-11 or WD12 three-tube receiving set or parts for same. Give names and value of parts. C. Dillman, No. 246, Webb City, Okla.

THREE NEW 50 WATT TUBES. Never used. $20 each. W. N. A. B., Bowling Green, Ky.

FOR SALE—Radio Receiver, Navy type, cost $595. Good condition. Dealers invited to call and see. Also 8 genuine "Vario-perm" guaranteed .001 variable condensers. Columbia Print, 1493 Broadway, Room 326, New York City.

TUBE RADIO SETS, $21.50 up. Parts sold at reasonable prices. Price list free. State whether interested in sets, part. McLean, 8103 Maryland Avenue, Cleveland, Ohio.

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RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

VENTRILOQUISM taught almost anyone at home. Small cost. Send 2c. stamp today for particulars and proof. Geo. W. Smith, Room M-643, 125 N. Jefferson Ave., Peoria, Ill.

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ELEMENTS OF RADIO TELEPHONY, by Wm. C. Ballard, Jr. A standard book on radio telephony, the work of a recognized authority. Accurate, simple, clear, reliable and strictly up-to-date. For the technical man who wants to post himself on radio and for the radio enthusiast who wants the fundamental principles of radio and their application tersely and entertainingly presented. Price, postpaid, $1.50. The Columbia Print, 1493 Broadway, New York.

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Technical Radio Service Wants Latest News

Editor Radio World: The writer has established a service department in conjunction with one of the well established retailers in this vicinity. The purpose of this department is to be purely technical and to render service and information to the new fan and those floundering around in the dark wishing to obtain a good reliable set for themselves. Also for those who now have sets that sound wishy-washy or like a boiler factory in full bloom.

We have great difficulty here on the Coast to get the new improvements and the necessary information regarding new developments. From four to six weeks elapse between the time some authority in radio publishes his findings before we get a glimpse of it.

This is a deplorable condition and lies in the fact that no one has ever taken advantage of a service back in the East to hand out these findings hot off the griddle.

It is with the hope in mind that you can place me in touch with such a service and also place me on everybody's mailing list.

Yours very truly,
WESTERN RADIO ENGINEERS.
Frank D. Andrews.
5937 Sunset Blvd., Hollywood, Calif.

Opera Festival Cancelled By Royalty Demands

The Information Bureau of Broadcast Central, Aeolian Hall, New York City, sends the following interesting communication to RADIO WORLD:

We regret exceedingly that plans to broadcast the Spring Festival of Italian Grand Opera which were recently announced through this bureau failed to materialize owing to restrictions placed on the use of the music which is copyrighted by the American Society of Authors, Composers and Publishers. Attempts to substitute other music free from such restrictions as well as efforts to persuade the society to grant temporary permission to use the copyrighted music were of no avail.

"Every precaution is taken at WJY and WJZ to eliminate last-minute cancellations on our programs but circumstances peculiar only to the case of the Italian Grand Opera feature which developed but a few hours before the performance prevented our recalling the press announcements."

All Dressed Up and a Real Place to Go!

Editor, Radio World:—I have just received back from the binder two copies of RADIO WORLD, volume 1, April 1921 to September 1922, handsomely bound in half morrocco, light red English buckram, handsomely gold stencilled on the back, with gilt tops.

And this is a valuable addition to my already large wireless and radio library.

I will continue to subscribe to two copies in the future.

I write you this letter to respectfully request that just as soon as you publish an index, or for any future volumes, to kindly send me two copies of the same.

Yours very truly,
New York City. P. C. KULLMAN.

"Leviathan's" Call Is WSN

WHEN the Shipping Board's giant Leviathan sails on her trial trip from Boston on June 19, she will keep in touch with the land radio stations by radio and will answer the call WSN. Radio Operators Jack Irwin and E. N. Pickerill will be in charge of the big

Marconi Acquires Radio Station at Vienna

THE Marconi Company has taken over the Austrian Government radio station at Laaerburg, just outside of Vienna. This has necessitated negotiations between that company and representatives of the Naval Communication Service regarding charges for traffic handled in the future for the Naval Communication Service. This station has formed since the War, a link in the Naval Communication Service in Europe from Paris to Constantinople. Messages are sent from Paris by telegraph via Coblenz to Vienna. Navy enlisted personnel in the telegraph office at Vienna receive these messages and transmit them by telegraph a short distance to the radio station at Laaerburg where Navy operators, utilizing the Vienna radio transmitter during certain hours of the day, transmit the messages to American vessels in the Mediterranean and at Constantinople. Service will continue as heretofore via the Austrian radio station, but a certain rate per word will be paid to the Marconi Company for despatches transmitted through the Vienna station.

Naval Airships to Have Radio Compasses

PLANS for equipping the two new Naval rigid airships with radio compasses so that they can navigate in darkness or in fog are under consideration. These are the great ZR ships now building. It is believed that the radio compass installations can be made satisfactorily, and that this feature will prove a valuable asset for the efficiency and safety of both personnel and material through assisting the accuracy of navigation. The location selected is adjacent to the observation platform located on top of the ship, well forward. A coil has been designed which will enable observations to be made on frequencies extending over a band of from, approximately, 600 to 16 kilocycles. If this installation is made satisfactorily, it will be the first time a radio compass has been successfully utilized upon a lighter-than-air craft.

American Radio Exports Increase

DURING the first three months of 1923, the value of exports of American-made radio and wireless apparatus exceeded a half million dollars. An increase of over $30,000 a month since the first of the year is shown by figures just issued by the Department of Commerce.

In January, these exports were valued at $141,577; in February the value increased to $173,909, and in March the figure was $213,094.

Of the March exports, $70,273 worth went to Quebec and Ontario, $37,030 was purchased in Cuba, and $25,068 worth was shipped to Mexico. The weight of the shipments was approximately 58 tons.

Will Hold Examination for Radio Gunner

IT is expected that the Bureau of Navigation of the Navy will hold an examination for Gunner (Radio) about the middle of August, 1923. The bureau will notify the service at large as soon as it is definitely settled. In all probability, requirements for this examination will be the same as those incorporated in the Bureau's Manual. This is a step in advance for radio in the Navy as the gunner is a warrant officer and stands

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4 Volt $3.50

UV-201-A	$6.10
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SUNBEAM QUALITY coils, to complete the COCKADAY CIRCUIT. One guaranteed, accurate set of coils consisting of one plain and one Bank-wound coil sent postpaid for.....$2.75

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All the family can tune-in with

ACCURATUNE

MICROMETER CONTROLS

Granddad, dad, mother and little brother all agree that "it is real joy to tune-in now with Accuratunes." A slight turn of the smaller knob operates the micrometer control for delicate tuning. Those stations you used to work so hard over, and others you could "just about get" are easily brought in clear and strong with Accuratunes. Knobs are of genuine Bakelite, either black or brown. Dial is of aluminum with neatly engraved graduations. $3.50 at your dealers' or by mail.

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See prices at end of this page

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"Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon.
Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.

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JUNE 3.

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Design for an Amateur's Receiving Set, by C. White.
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How to Put a Vernier on Your Condensers, by Orthcrus Gordon.
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Factors That Affect the Range of Transmitters, by B. R. Cummings.
New List of Broadcasters Recently Licensed.

Any single copy of Radio World, beginning with No. 1, mailed on receipt of 15 cents postpaid. Any seven issues for $1.00. The above 32 numbers sent for $4.50. Or send $6.00 for 1 year (52 numbers) and have your subscription start with any number. Radio World, 1493 Broadway, New York.

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Keep Your Tail Up—Advertise!

IN season and out of season advertise; tell your merchandising story. Especially advertise out of season. People earn and spend just about the same amount of money for their pleasure and amusement winter and summer, and they spend it for the things that are advertised.

Overhead is continuous. No manufacturer of a standard brand of radio goods can afford to stop advertising during the summer and let his brand be forgotten. Does Victor Phonograph or Wrigley's Gum or any of the others that have made millions in advertising ever stop?

Here is what happened to a success when they stopped advertising. Cook's Flaked Rice was one of the first and best known breakfast foods—their factory was running in three eight-hour shifts to supply the demand. They stopped advertising and went entirely off the market.

Pearline was advertised for years in season and out of season and made millions for the manufacturers. Their advertising ceased. What has become of Pearline?

The Magnavox manufacturers are increasing their advertising this summer. Watch the results in comparison with the other loud speakers who curtail or stop their advertising during the dull season.

What does a radio dealer think of a manufacturer who loads him up with goods in the late spring and then stops advertising until Fall? Can a radio manufacturer afford to treat his trade this way? Is not continuous, year-round advertising absolutely necessary?

Good merchandising means continuous sales. Continuous sales are only obtained through continuous advertising plus customer sales effort.

To advertise a brand or trade name for six months, and then stop advertising and let the buying public forget you for the next six months is, to say the least, bad management.

Advertise now. The great creative sales power of advertising will overcome a dull period. That is what advertising is for, to stimulate and create business when business is sluggish or dull.

We have evidence to prove that RADIO WORLD, the national illustrated weekly, brings quicker, larger and more satisfactory sales results from both the consumer and dealer than can be obtained for the same amount of cost in any other radio publication. Let us show you the evidence.
RADIO WORLD, 1493 Broadway, New York.

Radio License Required in Czechoslovakia

THE manufacture, sale, storage and importation of radio telephone and telegraph equipment in Czechoslovakia is only permitted under license from the state, says Trade Commissioner H. L. Groves in a report to the Department of Commerce. The Ministry of Commerce in cooperation with the ministry of Posts and Telegraphs are authorized to grant licenses for this purpose. The Ministry of Posts and Telegraphs also supervises and controls the manufacture, sale and storage of radio equipment and cooperates with the Ministry of Commerce in the granting of licenses.

Up to the present time only one company, "Radioslavia," has obtained a license for the manufacture of radio equipment in Czechoslovakia. It has not yet started production. This company is understood to be affiliated or closely connected with the French Company "Societe Francaise Radioelectrique." A German company, "Gesellschaft fur Drahtlose Telegraphie, System Telefunken," is said to be promoting a company, but it has not yet been granted the necessary license.

The attitude of the Ministry of Posts and Telegraphs toward the granting of licenses to transmit as well as to receive radio messages is said to be favorable in the following instances:

(1) Technical High Schools, for scientific purposes.

(2) Industrial establishments which have obtained special licenses from the Ministry of Commerce to manufacture radio equipment.

(3) Ships and aircraft.

(4) Electric power stations, waterworks, and other establishments of public utility, under special conditions.

(5) Companies which have been authorized by the State to broadcast matter of general interest, such as news-statements, exchange reports, agricultural reports, concerts, lectures, etc.

Licenses for the operation of receiving sets only will be granted to institutions, companies and those regularly taking the report stransmitted either by the State Telegraph Office or by companies authorized by the state to transmit such messages.

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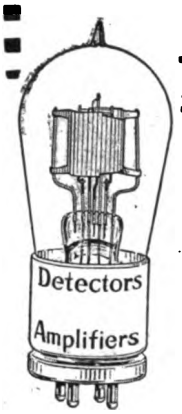

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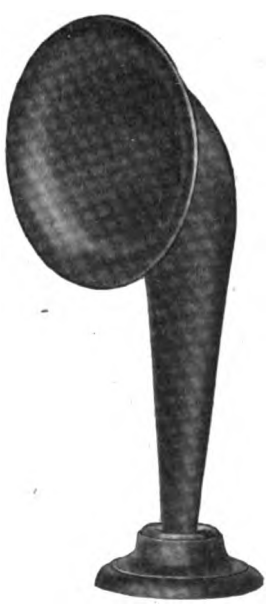

"Granolite"
Made in three sizes.
No. 1 with - 7½ inch bell; height, 15 inches.
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THE ALL-WOOD, PERFECT REPRODUCING HORN YOU HAVE BEEN LOOKING FOR

They will not warp, crack or peel

"GRANOLITE" Universal Radio Horns are positively superior to all others because we have embodied in their construction perfect acoustic qualities, careful workmanship, high grade, carefully selected materials, strength and beauty of design. The base construction and equipment is universal, permitting the installation and use of any of the standard and well known loudspeakers and receivers.

LIST PRICES

No. 1 Horn, 15" high..... $8.00
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Immediate Delivery Prepaid on Receipt of price. Above prices apply to horn and base only. If horn is wanted complete with receiver add $6.00.

Dealers, write for own special trade proposition.

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Enclosed find $1.00, for which send me Radio World for eight issues, beginning with your number dated.....

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Six Months	3.00
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Series, Parallel, Direct-Ground

Patents Pending

Operates on but four contact points for all three positions. The number of wire connections are thus reduced to one-half, simplifying the hook-up. Easy to mount and simple to operate.

The three positions enable you to receive long, short or medium wavelengths. Instructions for mounting and for wire connections given with each instrument.

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FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

The Rand McNally Radio Map of United States is 28x20 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

Price 35c Each

THE COLUMBIA PRINT
1493 BROADWAY NEW YORK CITY

Heard at the Radio Counter

Episode XV

GOOD day, sir, anything I can do for you?"

"Yes, I am after a little information and thought that maybe you could advise me. You see I am perfectly dumb at this radio thing and at the same time I am very anxious to learn what it is all about."

"It's a very interesting game, once it gets into your system. It is really surprising how quickly you understand it. However, just what is your problem? I will try to help you out."

"Well, you see I intend camping in the mountains this summer with the kiddies, and, of course, I would like to take a radio set along, but don't see how I can without loading up with a lot of extra trunks and apparatus. Can you suggest any way to do it?"

"Why, everybody is taking their radio with them this summer. It can be accomplished very easily. You can take a small loop set, or even a small one tube set, if you have any place to erect a small antenna. Will you step over here while I show you some of the apparatus?"

"I suppose that they are all what you call crystal sets, aren't they?"

"Why, no. You see since they have brought out the dry cell tube, there is no need for heavy storage batteries, and therefore the sets are perfectly portable. They can be carried any place you go without the necessity of even thinking about batteries. Of course the loop sets do not need even an aerial or ground and can be operated even in a boat or canoe."

"Well, that is real interesting. I am sorry but I have to hurry away, but if you are here this evening I shall be pleased to drop in and arrange things with you. Have you a card?"

"Certainly, here you are. We are open until 10:30. Good afternoon."

Admiral Ziegemeier's New Duty

REAR Admiral Henry J. Ziegemier, Director of Naval Communications and one of the foremost experts of the Navy, has been detailed to command the Norfolk Navy Yard. His successor as Director of Naval Communications has not been named, but it is stated that Commander D. C. Bingham, assistant director will be acting chief.

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Replaces loops, aerials, electric light plugs, etc. Brings clearer signals and truer tone.

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The latest and most essential part of an efficient tube set

Variable Resistance Leaks

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Mounted on any panel in a few seconds—2 screws serving as connections behind panel.

Get stations you never heard before

No pencil markings—assure unbroken range of 180 degrees. Clarifies signals—eliminates hissing.

Complete with either .00025 or .0005 mfd. Micon Cond..... $1.00

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At your dealers—otherwise send purchase price and you will be supplied postpaid.

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Please save me a copy of Radio World every week.

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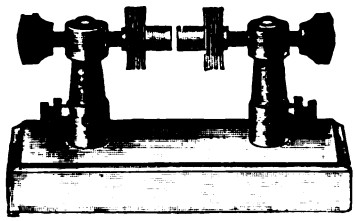

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DEALERS: Have you received our bulletin?

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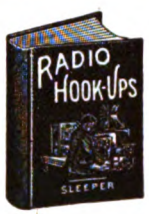

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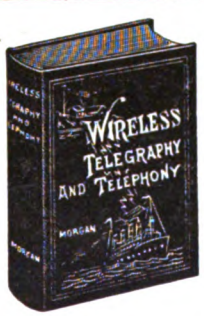

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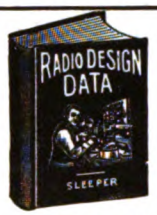

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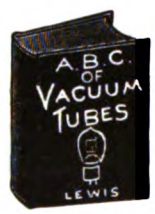

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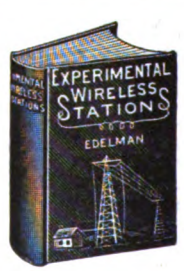

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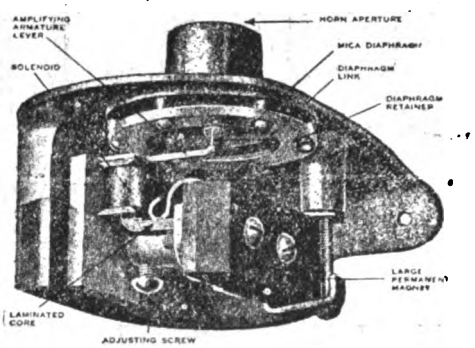

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Warning from Our Technical Editor

LETTERS galore have come to RADIO WORLD asking questions, making statements, and wild ones at that, regarding circuit diagrams published. Every one of them shows just one thing: Readers do not *read the instructions carefully.* They simply glance at the circuit, glance at the text matter, and then "fly off the handle."

This is especially true in the case of the more complex circuits, such as the multi-tube reflex circuits, and the super-regenerative, or other multi-tube circuits. All the letters show that the writer has not intelligently read the article, and therefore has misconstrued some detail or entirely missed the whole thing, with the result that he thinks he has a complaint to register.

If people who are going to construct sets only look at the diagrams without reading the text relative to it they cannot possibly meet with success. An architect can follow blue prints of a building if there are footnotes and measurements. Otherwise he will be just looking at a lot of white lines on a blue background. The same applies to radio sets. And also take into consideration the fact that the architect has studied his business and understands it.

If you have never made your own set before (and many letters state that, decidedly and disgustedly) don't pick out some multi-tube reflex, or super-heterodyne to start on. The instructions in the text and the diagrams are all thoroughly clear to one who has had a little experience, but you would not expect a man who has been fixing Fords to be able to fix his 17-jewel watch with a pair of gas pliers. This is exactly the status of the man who has never constructed a set when he tries to make his own super or reflex. And then, to back the bargain up, he never even makes a serious attempt to understand what he is doing, but glances at the instructions, and if he can't understand something he lets it go and starts in anyway.

In the construction of these complex sets there are many little details that have to be taken into consideration. They may appear minor at first glance, but when you think that even the *tiniest variation* from the standard will cause the circuit to be inoperative you will at least understand why it is so utterly impossible for you to do anything unless you *absolutely follow every instruction.*

Circuits have been worked out by experts, using apparatus that is capable of registering a micro-micro-ampere, and then when you go and disturb the balance of these fine adjustments by changing some minor looking connection, or connecting the wrong lead in some place, you should not expect results.

This article is not meant as a brake on the man who has a working knowledge of radio because he generally understands what he is attempting or at least has a definite reason for doing it, but when a man who has never made his own set tries to change the entire plan of things by working out some clever idea of his own, and then runs into trouble and blames the writer or the diagram, it is time to warn our readers to read the instructions *intelligently*, and follow them to the last inch.

In printing offices the rule is "Follow copy, even if it goes out the window!" That is a good rule in this case. If you follow directions absolutely and the set doesn't work then you have legitimate cause for complaint and criticism, and a real reason for asking questions.

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 21, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

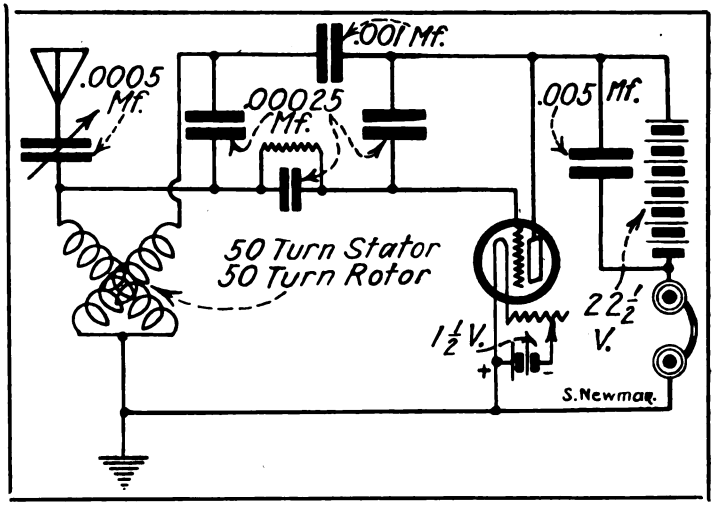
Vol. III, No. 13. Whole No. 65 June 23, 1923 15c. per copy, $6.00 a year

A Canadian "Hot Dog" Receiver

By A. D. Turnbull

ABOUT this time of year many experimenters and amateurs are trying to find some way in which to simplify their one tube sets so that they can conveniently pack them into suitcases and take them along "midst purling streams and woodland dells."

As the single circuit sets seem to have it over the tuned circuit sets in the matter of portability as well as volume, I have tried to devise some method whereby extreme selectivity as well as portability could be combined in the same set. The circuit shown herewith is about all that could be asked for in the way of a single tube regenerative set. A good point about this circuit is that there is only one control, the variometer, as once the antenna condenser is set, there is no more fooling around with it and all the tuning is done with the variometer. With this point in view, it is best to provide some means of vernier control, such as a small dial button for the variometer, as the tuning is extremely sharp, sometimes two stations coming in on one division, and a very slight turn of the variometer either way tuning one in to maximum and the other out.



Something new in "flivver" circuits. Extremely loud signals and sharp tuning are possible, but care should be taken in the construction of the condenser. The .001 condenser can be a variable if it is handy and will give better control of volume. The increase in signal strength will fully warrant the extra expense.

The apparatus needed for this set, exclusive of the panel and box, which I will leave for the builder to plan, as he knows his own needs best, and can get more fun out of it if he plans his own panel layout is: 1 variometer; 1 23 plate variable; 2 .00025 mfd. fixed condensers; 1 .00025 mfd. condenser and variable grid leak; 1 .001 mfd. fixed condenser; 1 .005 mfd. fixed condenser; 1 tube (dry cell preferable); 1 rheostat—10 ohm; 1 22½ volt B battery 1 1½ volt A battery.

In purchasing the apparatus, it is imperative that the condenser capacities be strictly adhered to as none others will give the proper results. It is also best to get mica insulated condensers as then you are always sure of the capacity being constant.

When assembling the apparatus it is well to keep in mind that the condensers and variometer should be thoroughly shielded and grounded to the ground post of the set.

The variometer being the main control of the set, it is best to buy a good standard make of about the same size shown on the diagram, preferably with about 50 turns on both the rotor and stator. If it is not possible to get one of the exact size, the standard make having 40 turns will do, the only difference being that the stations operating on 492 and 509 will not be heard as loud as with the larger size.

When tapping the variometer, make sure that you get the right side. There is generally one connection made on the shaft which serves as a connection to both the rotor and the stator. Make sure therefor when you are hooking your variometer in the circuit which connection is which, as if you reverse them, it will not help your set any.

Hooking up the condenser bank, around the grid leak and condenser, can easily be done by putting the three condensers in series, and taking your plate tap off the second one. This will eliminate wiring and make your connections easier and shorter. A word of caution in building this set is to make sure of your insulation. I found to my disappointment when out on a week end tramp, that it is not a good plan to use bare bus wire in connecting up your circuit. There is too much chance of a short circuit or connections crossing. I suggest that the set be wired with light cable such as is used in making drop lights, and running all the connections in bee lines.

A word as to the operation of the set. Make sure of your ground and throw a wire over a tree for an aerial. Then set your condenser at about 40 and turn your tube up. Turn your variometer slowly until you hear the carrier wave of the station, and tune in between the two squeals and listen to it pound in.

As a few closing words to the skeptics who desire to know just what this little circuit can do in the way of distance I might mention that 50 stations were logged in 24 hours, a few of which are WKAQ 3,000 miles, KFI 3,000 miles, WSB 2,200 miles. They were all copied using just one tube with 22½ volts on the plate.

If care is taken in the making this circuit will pleasantly surprise any one who constructs it.

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Pitfalls of the Radio Investigator and Inventor

By Everett N. Curtis

[*Everett N. Curtis, the author of this article, is the lecturer on patent and trade-mark law at Columbia University and is a patent solicitor in active practice in New York City. He is the author of Curtis' "Manual of the Sherman Law" and a number of monographs. He was graduated from the Massachusetts Institute of Technology in* 1898 *and from the Boston University Law School in* 1900.—*Editor,* RADIO WORLD.]

MANY engaged in radio research and experimental work are the victims of their own lack of knowledge, or of inertia to take pains to acquaint themselves with well known principles underlying the patent law, are prone, when finding themselves in a situation in which their ignorance has led them, to blame the law or some person or persons whom they think have taken advantage of their necessities and caused them to lose valuable patent rights. The purpose of this article is to point out some of these pitfalls of the inventor for which he himself through ignorance is mainly to blame, and to indicate ways and means by which such errors may be avoided.

Generally speaking the inventor is woefully unaware of the importance of keeping records and drawings of his invention and preserving evidence of the earliest date thereof, the dates of disclosures to others, and the dates of reduction to practice. He is ignorant of the bearing which the prior art or prior knowledge and use or the two years statutory bar or abandonment of his invention has upon his rights before he applies for a patent. He is ignorant of the effect of many years of a concealed use of his invention such as for example, a secret process. He is ignorant of the effect of filing an application without a full disclosure of his invention, and without adequate claims covering the full scope of his invention. He is ignorant of the requirement that all applications for patent in this country must be filed by the inventor, and that the filing by joint inventors (so-called), is in many cases a snare and a delusion and likely to result in the patent being declared void. He is ignorant of the necessity of guarding against the disclosure to the world by the issuance of his patent in this country, until he has protected his rights by filing in foreign countries. He is ignorant of his rights where he makes an invention when employed by others, where such invention is in the same line of work as that of his employment. He is ignorant of the effect of licenses and assignments, and the duty imposed by law of recording assignments at the Patent Office at Washington. He is ignorant of the fact that in any event all he obtains from a patent is the right to exclude others from the patent domain and a right of recovery for his damages or the infringer's profits.

This enumeration may seem at first glance as embracing matters technical in character, and as only to be apprehended by a patent lawyer of mature judgment and experience. The fact is, however, that any person of average intelligence may with little application, sufficiently acquaint himself with the law as to safeguard his inventions to a considerable degree and very likely avoid long and vexatious litigation which might otherwise result.

The patent law in this country is derived from the English law as it existed at the time of the colonies. Under our constitution it is provided that the Congress shall have power to promote the progress of science and useful arts by securing for limited times to inventors the exclusive right to their discoveries. The word "discoveries" is unfortunate, but is interpreted by the courts to mean the same thing as inventions. Beginning in 1790, a number of patent acts have been passed by Congress, and the law has become finally crystallized in the Acts of 1870 and 1875 as amended to date.

The most important provision of the law is Section 4886, under which it is provided, among other matters, that any person who has invented any new useful art, machine, manufacture, or composition of matter, or improvement thereon, not known or used by others in this country before his invention or discovery thereof, may obtain a patent. Thus it is provided that in every application for patent there must be present invention, or exercise of the creative faculty; there must be present novelty or newness, and there must be present utility, or usefulness. It is also provided in effect in the same section that a publication, either here or abroad, two years prior to the filing of the application or a two years' public use or sale in this country prior to the filing of the application will preclude the issuance of the patent thereon. Accordingly underlying the validity of any patent, are the prerequisites of invention, novelty and utility and the so-called statutory bars. Even though the patent be issued, no defendant is foreclosed from showing such patent is defective in any one or more of their particulars and accordingly void.

All that the inventor secures by his patent is the right, in the first instance, to exclude all persons from making, using or selling the inventions covered by it. This, it is true, is a very substantial right and includes not only the right to an injunction but also the right to damages and profits. It should be borne in mind, however, that this right is negative in character and is only presumptive, and that a patent may be declared null and void by the courts for a variety of reasons, as for example, that the inventor was not the true inventor, that the so-called invention is not an invention but involves only mechanical skill, that it is not new, or that it will not operate, etc.

All inventions must be regarded in the light of the prior state of the art, and measured by the advance which they have made. If they are basic in character and perform a function never before performed, they are termed "primary" or "pioneer" inventions, such as the Goodyear process for vulcanizing rubber, the Morse telegraph, or the Bell telephone, and are construed broadly. If they are improvements upon what has gone before, they are secondary inventions and are narrowly construed. Mere mechanical skill is not invention, neither is mere aggregation, nor double use of an old structure, nor duplication nor enlargement, nor mere change of form.

Want of novelty may be shown by prior publications or patents in any language or by any prior knowledge or use accessible to the public. Want of utility may be proved by showing that the so-called invention is inoperative, or that it is injurious to the morals, health or good order of society.

(*Continued on next page*)

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A Handy Tuning Unit for a Loop Set

By Kenneth Malcolm, A. I. R. E.

THOSE fans who have purchased or built loop sets for use during the summer, occasionally would like to reach out for greater distances or would like a greater volume than that afforded by the sets in question. The provision for a regular aerial and ground would make this entirely feasible, as very frequently there come times when the atmosphere is almost entirely free from hot weather annoyances. By means of this provision, a single set could meet almost all the varying conditions of weather, and hence could be used all the year round.

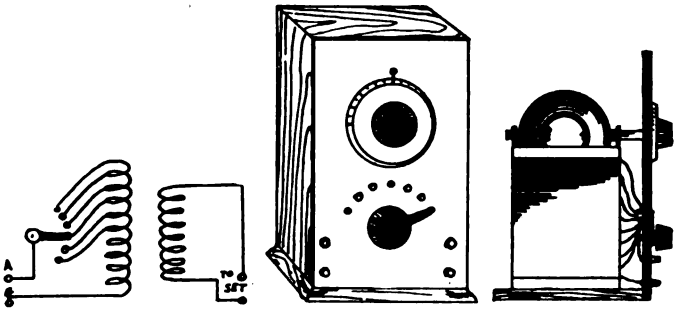
There are many sets that employ loops in which the change can be made directly, by simply removing the loop and connecting the leads directly to the aerial and ground. But sets such as the one described by the writer in a recent issue of RADIO WORLD, or those of the plain regenerative type, having the loop connected in the place where the secondary of the variocoupler would ordinarily be connected, would require the addition of a variocoupler unit before an aerial and ground can be used satisfactorily. Such a unit will be described in the following paragraphs.

The list of required material includes an insulating panel about 5x7½ inches, a variocoupler, a dial for the coupling adjustment, a switch and the necessary switch points for the wave length adjustment of the coupler primary, the necessary connecting wire, four binding posts and a cabinet.

The panel should be laid out carefully and holes drilled for the coupling shaft, the switch and switch points and the binding posts. The layout suggested in the drawing is neat and attractive. For the sake of convenience it is a good idea to mount the coupler on a sub-base, instead of on the base of the cabinet, or else it could be mounted directly on the panel by means of two small brackets. Before you fasten it permanently it is best to solder the tap leads to the switch points. Now you can assemble the whole affair, and make the connections as shown in the circuit diagram. The end turn of the coupler should go to the lower left hand binding post, the switch lever should go to the upper left hand binding post and the two secondary leads should go to the two right binding posts. When this wiring is done the panel may be secured in the cabinet, and your unit is complete.

If the set that you wish to use the unit with is of the type before mentioned, it might be well, first of all, to replace the single circuit loop jack with a double circuit jack, and also to mount a pair of binding posts at the lower left hand corner so that they will be opposite to the right hand posts on the unit. Nothing but the jack wiring need be changed. Simply connect the two leads that went to the old jack to the outer prongs of the new jack—the contact prongs. Now, neatly run wires from the two inner prongs to the set of new binding posts. By connecting the two right hand posts of the unit to the two new posts of the old set, the arrangement is ready for operation. If you follow the instructions closely the changes that must be made will be found much simpler than they sound.

With the double circuit jack arrangement, the change between regular aerial and loop aerial is entirely automatic. The aerial and ground connections on the unit may be left on permanently, and either aerial may be used at a moment's notice by simply plugging in or taking out the loop from its jack. This convenience cannot be entirely appreciated until it is tried.



Circuit hook-up and constructional details of a handy loop unit.

Sets which do not have the jack can be used with the unit by removing the wires that lead to the loop and connecting them to the right hand binding posts of the unit.

(*Continued from preceding page*)

One of the first steps to be pursued by an inventor should be to ascertain whether or not his invention is new, that is if it has patentable novelty. If he is a skilled mechanic, or if he is engaged in a business which brings him into close contact with the art and the trade, he will probably know if there is any commercial device on the market which anticipates his invention. It is quite possible, however, that there may be somewhere in the world a prior printed publication accessible to the public showing and describing his device in some language which he has not seen. If there is any such publication, it is probable there is a copy of the same in the United States Patent Office or perhaps in some public library in any of the great cities. A search therefore at the Patent Office and through technical libraries accessible to the public would probably disclose the publication. In order, however, to be fairly certain there were no prior publications, a very thorough search would be required, which would be expensive and perhaps beyond the means of the ordinary inventor, who would have to be satisfied with his own investigation at the public library, where both scientific works and copies of domestic and foreign patents might be accessible, or he might have made for him the usual preliminary examination by some resident patent attorney at Washington, who for a small fee would make a cursory examination of the class of U. S. patents where the invention was likely to be found and would send copies of the nearest patents. Such preliminary examination is often of great advantage, since it will usually disclose any very close references, but the inventor must be cautioned from placing too much dependance upon it, as it is at best only a makeshift and cannot in the nature of things be exhaustive. Where the inventor is well acquainted with the art, he could very well in many cases dispense with such examination, and rely upon the Examiner after the case gets into the office to discover and cite such references if any. Even after the usual preliminary examination is made, it is quite likely that the Examiner will cite references not disclosed by it. Such preliminary examination is, however, a safeguard, and in case the inventor is ignorant of the prior art, it is to be recommended for what it is worth.

(*To be continued in next issue*)

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Amateurs Increase by 1334 in Five Months

LEST some fans believe that the reception of broadcasts is the only popular phase of the radio art, be it known that amateurs are still entering the game of "key pounding" at the rate of nearly three hundred a month. Since January 1 last, 1,334 amateur licenses have been granted by the Department of Commerce, and on June 5 there were 18,232 such stations in the United States.

The distribution of amateur stations by Districts as of June 5th, was as follows:

District	Headquarters	Total
1	Boston	2,490
2	New York	2,629
3	Baltimore	1,994
4	Norfolk	444
5	New Orleans	941
6	San Francisco	2,172
7	Seattle	901
8	Detroit	2,932
9	Chicago	3,729
Total		18,232

The above table does not include special amateurs, of which class there are 201, no new licenses having been issued recently. It has been decided by the Department that hereafter District Radio Supervisors will issue special amateur station licenses instead of the Washington office.

The waves assigned to special amateurs are between 150 and 220 meters for use in CW telegraph. Regular amateurs operate on 150 to 200 meters.

WWV Transmits More Standard Test Waves

IN an effort to permit radio operators and fans to check their wave meters and instruments on standard waves, the Bureau of Standards will transmit standard wave lengths, commencing at 10:55 p. m. each night, on July 17, August 15, September 13 and 28, and October 7.

On the last date WWV will enable amateurs to calibrate their receiving and transmitting sets, since the band covered will be from 222 to 150 meters, the signals being sent between 1:50 a. m. and 3:41 a. m. The schedule, which should be kept for future reference, follows:

Date	Frequency, K/c	Wave Length, Meters
July 17	425-1,500	705-200
Aug. 15	425-1,500	705-200
Sept. 13	425-1,500	705-200
Sept. 28	500-1,700	600-176
Oct. 7	1,350-2,000	222-150 (Amateurs)

In continuation of the established practice the Bureau will transmit the call signals "WWV" both in radio telegraph and telephone, each wave length occupying about nine minutes of time.

Loop Antennae Data for Any Wave Length

WHEN you discuss loop antenna with the fan of average knowledge, he will start to tell you that it is perfectly O. K. for broadcast work or amateur reception, but "What are you going to do if you want to receive the long wave transatlantic stations or ships or commercial?" Well, if you happen to be in on the know you will, of course, laugh at him, but if you are not you will swallow it whole, and thereby miss a lot of fun and good experiments by heeding him.

Did it ever occur to you that you could make a loop that would respond to any wave length you wanted? Well, with a little extra work and some knowledge of the correct condenser capacities, windings and sizes, you can make loop antennae that will take the place of any outdoor antenna and you don't have to be afraid that the landlord will object.

Just to show you what you can accomplish if you want to, take a peek at the table below and give some deep thought to it before you condemn the landlord for making you stay off the roof with your wires.

WAVE LENGTH OF A FOUR-FOOT LOOP WITH VARIOUS CAPACITIES ACROSS THE TERMINALS

No. turns in loop	Condenser capacity in Microfarads (across terminals) .00005	.0001	.0005	.001	.002	.003	No. turns per slot
1	....	65m	128m	178m	250m	310m	1
3	130m	155m	290m	400m	550m	675m	1
6	230m	280m	500m	710m	1,000m	1,200m	1
12	430m	490m	920m	1,250m	1,700m	2,050m	1
24	760m	880m	1,600m	2,100m	3,000m	3,600m	1
48	1,550m	1,775m	3,150m	4,300m	6,000m	7,000m	2
72	2,200m	2,650m	4,800m	6,400m	8,800m	11,000m	3
120	3,930m	4,500m	7,900m	10,000m	14,700m	17,700m	5
240	7,600m	9,000m	15,650m	20,500m	27,200m	32,900m	10

Note: The slots are calculated to be one-half inch apart, and deep enough to accommodate the number of turns necessary.

It can be seen from the above table that it is comparatively easy to cover any wave length from 65 meters up to 32,900 by the use of the correct amount of wire and capacity. In order to figure the amount of wire for such a loop, the following method should be pursued: Take the number of turns necessary and multiply it by 16, which is the square of four, each side of the loop being four feet. It seems incredible that stations 3,000 miles away using waves of 20,000 meters can be received on a four-foot loop, but the table above has been compiled from actual data and everything is worked out so that fans can go ahead and use it.

To Make Your Old Set New

You can increase the range of your receiver by the use of parallel condensers in your circuit.

You can use honeycomb coils to load up your circuits by inserting them in the proper circuit. This means only the breaking of two leads and the insertion of the coil and should be employed in any short wave set, as it allows any range to be reached. It is especially useful in single circuit sets.

You can remove the present inductance and use either bank-wound inductance or re-wind your present one to meet the longer waves.

Increase the length of your antenna to take in the new waves.

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Naval Radio Personnel Receives Rigid Training

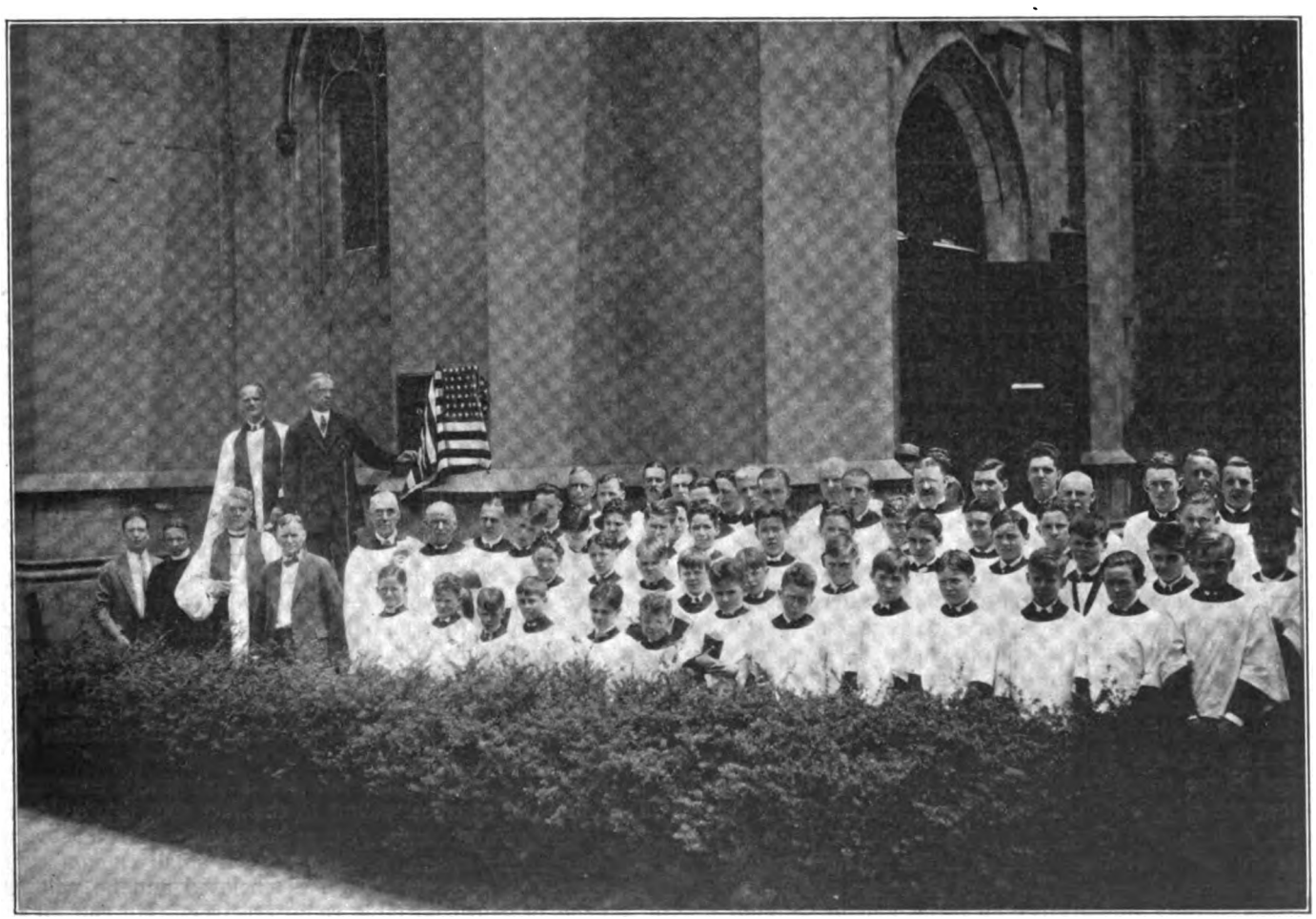
THE Naval Communication Service in the past three months has made gigantic strides in efficiency chiefly through educating its untrained personnel. Courses of radio instruction, in addition to the regular schools at Great Lakes, Norfolk and San Francisco, have been prepared and the results are "very gratifying," a recent report states. To-day the 1,200 radio men stationed ashore are receiving intensive training in fleet communication so that they will be familiar with sea operation. To-day the personnel of the Communication Service of the Navy is in better shape than in any other branch of the service, officers are credited with saying.

A survey of the radio personnel situation just completed by the Navy, shows that there are 2,443 radio men on duty, and that vacancies in the three higher rates exist. Following examinations held in May, 170 radio men were promoted to higher rates, fifteen of them becoming Chief Radiomen. There was still a shortage of 562 men in the service.

Opportunities in the Naval Radio Service are good for young men, communication experts point out, citing a recent case where a young man of 20, who held the rate of First Class Radioman, was persuaded to remain in the service, because at 32 he would be eligible for transfer to the Reserve with a regular income of $75 to $80 a month. No such opportunity awaited a young man in ordinary business pursuits, it was explained. This young man is now en route to sea duty in the Mediterranean.

Discrepancies in transmission of messages by the Navy have been decreased markedly during the past six months. During a recent period of supervision, five Atlantic stations had no errors, while the only two out of the other seven had over one-tenth of a word in a thousand wrong. Manipulation has improved greatly, operators are better instructed in procedure and are more attentive, the report states.

JANUARY 2, 1921
FROM CALVARY CHURCH
FOR THE FIRST TIME IN HISTORY
A CHURCH SERVICE WAS BROADCASTED BY RADIO WIRELESS
BY THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
THIS TABLET WAS PLACED (1923) BY THE UNSEEN CONGREGATION



(C. Photonews)

Unveiling of the tablet dedicated to the radio congregation of Calvary Episcopal Church, Pittsburgh, Pa., first church to broadcast services. The story of this ceremony appeared in RADIO WORLD for June 16. H. P. Davis, of the Westinghouse Company, is shown unveiling the tablet.

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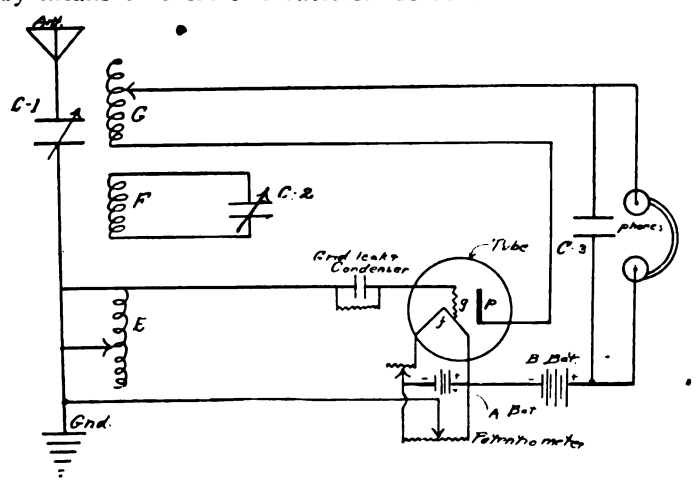
Tube Hook-Up of Interest to the Vacationist

By C. White, Consulting Engineer

THE advent of the WD-11, WD-12 and U.V.-199 now makes it possible for any one to own a radio set without feeling the burden of unnecessarily heavy upkeep expense. There are no battery chargers or bulky storage batteries to be contended with, and, above all, a portable radio set is within the reach of each and every vacationist. But it must be remembered that all of these tubes are not soft detector tubes and a set designed to use them properly must take this fact strictly into account. A soft or gaseous tube is very critical in the adjustment of its plate voltage and filament current while a hard, or high vacuum tube, when used as a detector is not appreciably sensitive with respect to either of these two controls. Therefore it is quite evident a receiver of the regenerative type that is built to function well with soft detector tubes might not give any reasonably good results with the new types of tubes unless certain changes are made. Hence since the new tubes are not very sensitive in regard to plate voltage and filament current it is foolish to expect any wonderful results if we attempt to control regeneration by means of these two factors. A better method of con-



Circuit incorporating a new idea in coupling. The three coils are wound on the same form and the feedback coupling between coils E and G is controlled by the condenser C2. Extreme selectivity and very fine control of the regeneration can be had by this means and it is absolutely quiet and stable in action, as well as free from interference.

trol is to look to the design of some type of tickler coupling which would offer a better method of vernier control than the rotating coil or rotor such as is commonly used on the single circuit type of regenerative receiver. In the type of circuit outlined in this article I have endeavored to overcome the difficulty of installing a mechanical vernier arrangement by using an electrical method instead of the movable or rotor tickler coil.

The coils E, F and G are wound side by side on the same bakelite tube, but the coupling between the tickler G and the tuning coil E is very loose as long as the circuit formed by the inductance coil F and the condenser C-2 is not tuned to the same wave length as the inductance E and the condenser C-1. Hence there will be practically no feed back action and regeneration can not be accomplished. But if F and C-2 are tuned to the same wave length as C-1 and E the coupling between E and G will be so increased that the tube will oscillate. Now by varying the setting of the condenser C-2 we can control the feed back or regenerative action with more ease than is possible with the ordinary style of rotor tickler. The construction of the coil units is quite simple since all three coils are wound side by side on the same tube, which should be four inches in diameter. The coils should be placed in the same relative positions as indicated by the schematic diagram: that is, the coils E and G should be on the ends of the tube while F should be in between the two. All the units are wound with No. 22 D. C. C. magnet wire. The coil E has 60 turns in all with taps at each 15; F has 40 turns with no taps, while G has 40 turns tapped every 10 for switch-points. There should be about one-quarter inch allowed between any two adjacent coils, and, figuring around 20 turns of wire to an inch, then about nine inches of tube length will be required. The condensers C-1 and C-2 are 23 plate air variables with some reliable type of vernier adjustment. The condenser C-3 is nothing more than a by-pass condenser for the phones and should have a capacity of .001 mfd.

The operation of this set is just about as simple as the construction. A little experience will be required at first in order to get on to the sensitivity of the various controls. In general there are two methods of tuning in a phone or broadcasting station. One is called the zero beat note method and the other is the critical point method. The former is accomplished by keeping the detector in the state of oscillation and moving C-1 and the taps on E until the carrier wave of the station is picked up. This fact is noted by a characteristic whistle, and as soon as we tune the wave the whistle will disappear for a point on our adjustment and then will reappear if we continue to move our condenser dial. The point where it disappears is called the zero beat note, and if we turn the condenser C-2 until the tube ceases to oscillate the station will be tuned in, and the amount of volume can be controlled to a certain extent by the condenser C-2 which will control the regeneration. This method of tuning in should *not be used* in cities or densely settled localities where there are other radio receivers nearby. It greatly disturbs the other fellow, not only annoying him but encouraging on the part of others the same method of tuning, which if carried out by many others would seriously impair reception in the neighborhood. In country or very thinly settled radio districts of a suburb this method can be used. But the best general method to use is the critical point method. In this the tube is set upon the point of oscillating by the adjustment of C-2. By a little experience you will soon recognize this condition by certain characteristic sounds in the phones. Now as C-1 is slightly moved a sort of breathing sound will be heard if a station is picked up and by finer tuning adjustment of the condenser it can be brought in clearer. C-2 must be moved along with C-1 if the latter is moved to any great extent. When the tube jumps into oscillation we can learn to recognize this conditon by a sudden click in the phones at the start of the oscillations and a sound similar to escaping steam or vapor that accompanies the state of oscillation. With a little precaution on your part you can readily learn to prevent this from occurring and save annoying your neighbor who is trying to get some pleasure out of radio likewise. After you have tuned in your station by this considerate and sportsmanlike method you can use the 300 ohm potentiometer as a vernier adjustment on the amount of regeneration and volume. With local stations too much regeneration will sacrifice quality for volume.

Let me repeat that this set is extremely economical to build and operate, owing to the fact that dry cells replace expensive and heavy storage batteries. The clever amateur can readily assemble this set in a small cabinet complete with "A" and "B" batteries enclosed and he will have a good practical portable radio receiver. He can take it on his motor trips, his camping trips and to his summer cottage. All that will be necessary is to set up a suitable aerial and he will be ready to operate.

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How to Get Best Results from a One Tube Regenerative Set

By Byrt C. Caldwell

HOW many of us, when we look at those long lists of Radio Golf records made with one tube, sigh and wish that we could make those distance records too? Well, you can, and I am going to tell you how.

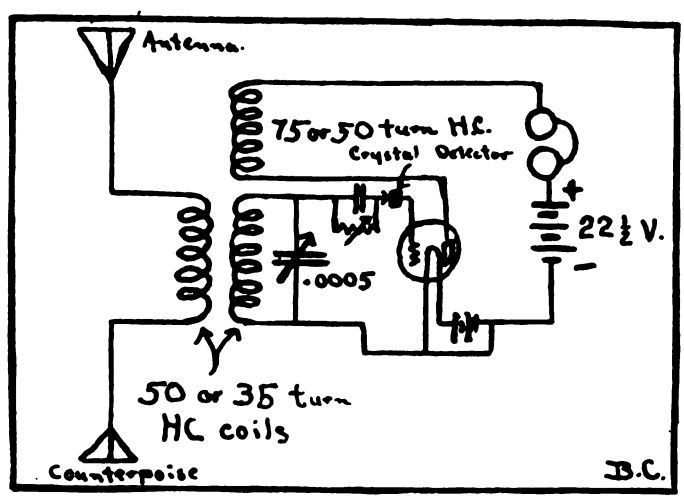
Without a doubt, the ideal one tube set for long distance work is the reflex. But as most of us have regenerative sets, I am going to write only about them. The best regenerative set is the three circuit, but wonderful results can be obtained with single circuit sets. If you have no set as yet, and are contemplating buying one, by all means get a three circuit set. The slightly increased cost will more than repay you by the better results and the greatly increased selectivity. The one I constructed and used was a honeycomb set, and I would advise anyone to use this kind. Some say that honeycombs are inefficient on low wave lengths but this is far from the case. I have obtained better results with mine than have many that I know of who are using sets which employ two variometers and a variocoupler.

I will start with the antenna and ground system. Without a good antenna and a good ground, DX results are impossible. A one wire aerial about 40 feet high and 80 feet long, constructed of braided wire if possible, is the ideal antenna. A buried copper or iron sheet ground is better than a water pipe ground. Some fans are prevented from obtaining good results because they live in a locality where it is an impossibility to get a good ground. For these, a counterpoise should be constructed. In fact, where it is possible every one should employ a counterpoise. This consists of another wire directly underneath the aerial wire and about ten feet from the ground. This is used in place of the ground. A counterpoise will give results two to ten times better than a ground. Have both antenna and counterpoise insulated as well as possible to prevent any losses of the tiny bit of energy which is collected. Use the best phones you can afford to buy.

We next come to the tuning. A little common sense, mixed with practice, will enable you easily to double or even to triple the range of your set. This is no exaggeration. When we look at the average broadcast fan and watch him twirl the dials, we wonder how he can get any results. In tuning three circuit sets, proceed as follows: First, after the batteries are connected and the filament is lit, place the secondary condenser at approximately the position for the wave length desired. Then tighten the coupling between secondary and tickler until the set howls. Then gradually loosen the coupling until this howling just stops. Now vary the secondary condenser until a station is heard. Many let the tuning go at this. However, the coupling between the primary and the secondary should now be varied. Do this carefully and slowly until a loud click is heard in the phones. Better results can be had if a condenser is put in parallel with the primary. When the rough adjustments above have been made, use infinite care in making much finer adjustments and you will find that you can bring in stations loud and clear that you never even heard before. Vernier attachments are extremely useful in making these fine adjustments and, for a nervous person, they are almost absolutely necessary.

Any fan who follows these directions carefully will find that, with a little practice, he will have doubled and tripled his range, and he will no longer look at the records made by the "DX Nite Owls" with a feeling of despair, for he will have become one of them himself.

I am showing here the hook-up of my set, which is one of the simplest and one of the most efficient possible to construct. You will notice that I use a variable grid leak. This greatly improves any set as you will find if you test one out. There are several good ones on the market. Connecting a crystal detector in the grid lead as shown will sometimes greatly increase the range. Don't be afraid to experiment with the connections of your set. You are liable to discover some little kink that will greatly increase your range. However, there is one precaution I would give before telling you to do this. Place a ballast tube in your "B" battery lead or use some other audion protective device, or you are liable to blow out a perfectly good audion.



Circuit diagram of a three unit regenerative set incorporating a new idea. A crystal detector in the grid circuit is said to increase the volume and also the range of the circuit. Try it out—it sure does "make 'em perk."

You will notice also that I do not use a rheostat. I have found it unnecessary for Myers, WD-11, and U. V. 201. I believe that they are unnecessary for any tube if the proper voltage A battery is used.

In a honeycomb set the proper coils for most stations are primary and secondary 50 turn, tickler, 75 turn. However, some of the stations with low wave lengths, such as WNAC (286 meters) require 35 turns for primary and secondary and 50 turns for the tickler, unless an antenna series condenser is used.

What is a "Converter"?

A converter is a machine used to convert D. C. to A. C. (direct current to alternating current). It is similar to a motor in construction, but is supplied with slip rings instead of a commutator.

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RADIO PRIMER

For the New Army of Radio Beginners

By Lynn Brooks

TUNING REGENERATIVE CIRCUITS: As before stated, a regenerative circuit allows great amplification of signals if properly tuned. The basic principle of this was explained, and we shall now see how it should be tuned to get that amplification, as well as the extremely sharp tuning that is possible with such a circuit.

Referring to the circuit published on page 11 of the June 16 issue of RADIO WORLD, where the combination circuit was shown, it is called to your attention that there are two circuits possible with this hook-up. We are mainly concerned with the regenerative circuit, so will explain the tuning of that particular one.

When it is desired to use the set the tube is turned up about half way, first making sure that the batteries are connected in the proper manner. As the primary or antenna circuit is the controlling factor in the tuning this circuit will have to be tuned first. This is accomplished by setting the switch arm or slider at a point approximating the wave length of the signal desired. Then the inductance of the secondary is varied along with the coupling of the secondary circuit. When tuning this part of the circuit the condenser C2 is not varied until the entire circuit is tuned, and then it is brought into play to increase the selectivity or cut down interference. All this time the tickler is not brought into play, but after the secondary coupling is closed or tightened the tightening of the tickler should be commenced. As it is tightened a rushing sound will make itself heard in the phones, and suddenly a sharp click will be heard. If signals were heard before the click a noticeable fact will be that they will lose their tone and become mushy or wishy-washy after the click. This is an indication that the point of regeneration has passed and that the circuit is oscillating or forcing oscillations through the circuit. In this condition it acts as a small transmitter, and the coupling of the tickler should be loosened and then increased up to just the point where the signals are loudest without bringing the oscillations over, or making the tube "spill."

The secondary circuit is now tuned, and if the signals are not loud or there is interference the primary circuit should be re-tuned to the place where the signals are loudest. After that all signals for one wave length are tuned by means of the secondary inductance and condenser, secondary coupling and the tickler.

If care is not taken in the tuning of a regenerative circuit you will become the pest of the neighborhood, and every one owning sets capable of picking up undamped signals will be bothered with "birdies," which manifest themselves in squeals, howls and little, high-pitched notes, which vary with every change in the tuning of the set. A little care taken in the tuning of the set and signals will pound in, and the maximum of amplification due to regeneration can be accomplished, and at the same time the set will operate quietly. The signals, instead of suddenly jumping in from a forest of howls and squeals, will be tuned in gradually and smoothly and will be a revelation of smoothness and quality. This method of tuning also obviates the necessity of re-tuning a station upon hearing it. A few precautions and instructions upon this method of tuning are necessary.

When tuning in on a regenerative set do not turn up your tube brightly and tune by the "beat note" method. This is what caused the noise in your and other receivers. Turn your tube down to the point at which it just has a sort of breathing sound when the coupling of the tickler is closed or tightened. If this is done properly no carrier wave notes will be noticed. Then do not disturb it and when the signals are tuned in you will notice that the carrier waves of the stations are not present to cause distortion and noise, but the voice or music will come in clear and loud.

When using a regenerative set it is always best to include a variable grid leak in the circuit. This will remove the tendency to howl on the part of the set and will allow the maximum amplification when properly set for a tube.

Do not let your receiver oscillate. When the click is heard, do one of two things. Decrease your tickler coupling, or vary the secondary condenser until it is just below this point, and note the clarity and strength of the received signals.

It must be borne in mind that the regenerative circuit, unless handled by some one who is used to it, is a tricky circuit as far as selectivity is concerned and at certain times unless a complete knowledge of your set is in your possession it will seem impossible to separate one station from another, or else one station will come in so loud that it will render any signals of less intensity inaudible by drowning them out. This is generally the fault of the tuning of some particular part of the set, or else there is some part of the set that due to faulty wiring is so close to another integral part of the circuit that the transference of energy is taking place through that place instead of the tuning controls. If such is noticed the place to look for trouble is in your wiring. In wiring a set see that all the leads cross each other at right angles, and that they do not run parallel for too great a distance, and even then it is a good plan to have a fair amount of separation between them. A properly designed and operated regenerative set is very selective in tuning.

In no set, either regenerative or straight detector circuit, where a tube is used as a detector, should the filament be turned up any higher than is necessary to obtain signals of intensity enough to make themselves comfortably heard in the receivers. If the tube is turned up higher the tube will oscillate and the signals will be no louder. They will be distorted and the original quality of the voice or music or signals is lost due to that distortion. It is also a waste of both valuable filament life and current. The tube that operates longest is the one that has been used properly, and just because you can put all the current into a tube without burning it out is no indication or excuse for doing so.

It is better by far to have a crystal clear signal in a pair of phones than to have a room full of funny noises and distorted music in a loud speaker. The real radio man is always known by the manner in which he tunes his set.

DISADVANTAGES OF REGENERATION: Due to the fact that the common regenerative circuit has the power of oscillating (which same principle is used in transmitters) a regenerative circuit, unless properly handled, will generate power of its own, and re-radiate this power, making a small transmitter of itself, whose wave length changes with every change in the tuning of the receiver. This disadvantage is paramount in closely populated sections, where there are numbers of regenerative sets handled by people who do not understand that they are causing interference in neighboring receivers by their sets. A regenerative set if allowed to oscillate will cause interference in receivers over quite a distance, and the persons owning regenerative sets in the neighborhood will be bothered by the radiated wave of the first set. Bear in mind that a regenerative set always gives the loudest and clearest signals just below the oscillating point, or just below the point at which it perks up or "spills."

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An Attractive Mounting for Tube Sockets

By Arthur G. Shirt

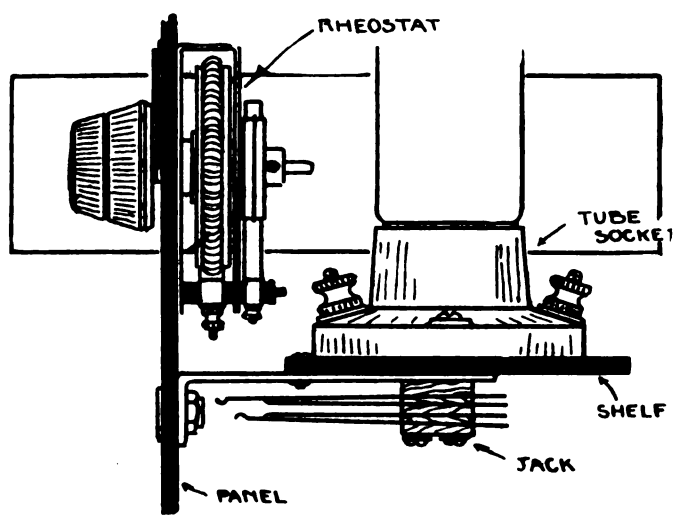
WHEN an amateur turns his constructive skill toward the building of what is known as a "double-decker" radio receiving set he fastens his midway shelf to the panel by either brackets or screws. This procedure necessitates drilling holes in the face of the panel, and it is also the cause of much annoyance, for all of us have had trouble in making such a shelf substantial. First, we thought we could drive in long, thin screws from the outside of the panel, but we found that wood splits easily when screws are driven into its edge. We also discovered that a shelf supported only from the front is unsteady, and the final outcome of our experience was the addition of two brackets, with the additional holes, trouble and time.

All this, although quite usual, is not in the least necessary. An amateur who was doing a lot of "double-deck" building wasted his time and patience so many times that he decided that if there was a better way of mounting a back-panel shelf he was going to find it. After much labor he finally hit upon the idea of inverting his telephone jack, using its base in the same way as a bracket, and thus mounting the shelf for the tube socket quite independent of the panel. When put into practice the idea resulted in a neat and novel back-panel shelf, easily constructed by any one with the fewest possible tools.

The shelf may be made out of either wood or bakelite, 2½ inches wide. The length of the shelf is determined by the number of tubes which are to be mounted upon it. For a single tube a strip of material 2½ inches long is about right, but for double or triple tubes the length must be proportionately increased. If only one tube is to be mounted there will be only one jack used as a support, while two tubes will call for one extra, etc.

The jacks are mounted on the panel in the usual way, but are inverted so that the metal bases are on top. Drill a hole in this base and tap it with an 8-32 machine thread. A corresponding hole in the shelf takes a machine screw, by which the shelf is fastened firmly to the jack. Of course, the strip of wood or panel material must first be drilled to take the tube socket or sockets, which must be placed so that there will be no interference one instrument with the other. The transformers may also be mounted on this shelf, either on the top and standing upright, or on the lower side hanging down.

The finished arrangement is not only neat, but attractive. It has other advantages, the chief of which are that it takes up very little room, shortens the leads to the various instruments, obviates drilling the panel, and is superlatively easy to apply, not only in single-tube sets, but also in receivers that boast as many tubes as a fellow has fingers on his right hand.



Space-saving method of mounting tube sockets.

Personality in Broadcasting

MANY broadcast listeners have become so immune to the romance of listening that they can simply tune their sets and upon hearing an announcer's voice say, without the least emotion or personal feeling, "Oh, that is WSB." Or else they will calmly announce the fact that they can recognize any one of fifty announcers without hearing the call of the station or the announcer's own letters. This, of course, is fine, but—wouldn't they rather listen to a program when the announcer makes them feel that he is telling them a personal secret and at the same time become so friendly that they feel they could go up to him on the street and say with a slap on the back, "Well, that was a corking program last night! I sure was surprised when you 'rang in' that 'cellist. He was great!"

Many have heard WEAF broadcast time after time, but how many can listen to the Sunday evening program when "Uncle Roxy" is speaking without having that "personal feeling" every time he announces? He is different from the rest and he demonstrates it. He doesn't announce as though it was a cut and dried affair which has to be done—he puts his personality into that little black disk and gives every listener an impression of interested friendliness. He introduces the performers in such a manner that you know that they are almost personal friends of both "Uncle Roxy" and yourself.

Why it is that more announcers have not tried this method is a mystery. Broadcasting is a personal matter and cannot be cut and dried. What difference does it make if they do crack a joke when announcing—they have the "air" and if a little humor will lighten the task of the performers and make them feel that they are working for friends instead of total strangers, think how much harder they will work to please and how much easier it will be.

When broadcasting, the announcer is not talking to mummies or inanimate objects, even though he is doing so through a conscienceless maze of modern scientific apparatus. He is talking to thousands—yes, hundreds of thousands of people who possess emotions that can be brought into play simply by manifesting his personality.

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Completed Offical List of Broadcasting Stations in the United States

FOLLOWING is the third installment of an official list of commercial broadcasting stations in the United States as issued by the Department of Commerce, and is continued from last week's issue. The list is completed with this installment.

As new allocations of wave lengths to stations now operating on 360 meters are made by the Department of Commerce, the changes will be published by RADIO WORLD.

Readers who save these installments will have a complete list of broadcasters with their station calls, location, frequency, wave lengths and power.

Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
WQAS	Prince Walter Co., Lowell, Mass..	1,130	266	100
KSD	Pulitzer Publishing Co., St. Louis, Mo.	550	546	500
WLAN	Putnam Hardware Co., Houlton, Me.	833	360	100
WBAA	Purdue University, W. Lafayette, Ind.	833	360	20
KDZQ	Pyle & Nichols, Denver, Colo.	833	360	100
WCAW	Quincy Electric Supply Co., Quincy, Ill.	833	360	10
WLAT	Radio and Specialty Co., Burlington, Ia.	833	360	15
KFHP	Radio Bug Products Co., Kearney, Neb.	1,220	246	10
WRAF	Radio Club, Inc., La Porte, Ind.	1,340	224	10
WJY	Radio Corp. of America, New York, N. Y.	740	405	500
WJZ	Radio Corp. of America, New York, N. Y.	660	455	500
WKAQ	Radio Corp. of America, San Juan, P. R.	833	360	100
KFAW	Radio Den, The, Santa Ana, Cal.	833	360	40
WGAX	Radio Elect. Co., Washington C. H., Ohio	833	360	20
KFEV	Radio Electric Shop, Douglas, Wyo.	833	360	100
WFAG	Radio Engineering Laboratory, Waterford, N. Y.	833	360	20
WHAI	Radio Equipment & Mfg. Co., Davenport, Ia.	833	360	15
KFEP	Radio Equipment Co. (Joseph L. Turre), Denver, Colo.	1,250	240	10
WQAX	Radio Equipment Co., Peoria, Ill.	833	360	20
WQAT	Radio Equipment Corp., Westhampton, Va.	833	360	50
WRAY	Radio Sales Corporation, Scranton, Pa.	833	360	50
WRAO	Radio Service Co., St. Louis, Mo.	833	360	100
KJJ	Radio Shop, The, Sunnyvale, Cal.	833	360	100
WRAS	Radio Supply Co., McLeansboro, Ill.	833	360	20
WMAB	Radio Supply Co., Oklahoma City, Okla.	833	360	100
KFDC	Radio Supply Co., Spokane, Wash.	833	360	10
KNV	Radio Supply Co. of California, Los Angeles, Cal.	833	360	100
WRAH	Read, Stanley N., Providence, R. I.	833	360	10
WGF	Register and Tribune, Des Moines, Iowa.	833	360	100
WHAZ	Rensselaer Polytechnic Institute, Troy, N. Y.	790	380	500
WBAU	Republican Publishing Co., Hamilton, Ohio	1,160	258	50
KLZ	Reynolds Radio Co., Inc., Denver, Colo.	833	360	500
WNAR	Rhodes, C. C., Butler, Mo.	833	360	10
KDZE	Rhodes Co., The, Seattle, Wash.	833	360	10
WRAA	Rice Institute, Houston, Texas.	833	360	200
KFCM	Richmond Radio Shop, Richmond, Cal.	833	360	50
WKN	Riechman Crosby Co., The, Memphis, Tenn.	833	360	50
WHAK	Roberts Hardware Co., Clarksburg, W. Va.	833	360	20
WNAL	Rockwell, R. J., Omaha, Neb.	833	360	100
KFID	Ross Arbuckles Garage, Iola, Kan.	1,220	246	20
KNJ	Roswell Public Service Co., The, Roswell, N. M.	833	360	200
WMAF	Round Hills Radio Corp., Dartsmouth, Mass.	833	360	100
WTAU	Ruegy Battery & Elect. Co., Tecumsah, Neb.	833	360	10
WIAW	Saginaw Radio & Elect. Co., Saginaw, Mich.	833	360	100
WCAD	St. Laurence University, Canton, N. Y.	833	360	100
WEW	St. Louis University, St. Louis, Mo.	833	360	30
KGY	St. Martin's College, Lacey, Wash.	1,160	258	5
KFDD	St. Michael's Cathedral, Boise, Idaho	833	360	10
WCAL	St. Olaf College, Northfield, Minn.	833	360	250
WPAT	St. Patrick's Cathedral, El Paso, Texas	833	360	10
KFCD	Salem Elect. Co., Salem, Ore.	833	360	20
WCAO	Sanders & Stayman Co., Baltimore, Md.	833	360	50
WQAF	Sandusky Register, Sandusky, Ohio	1,250	240	5
WWAC	Sanger Bros., Waco, Texas.	833	360	50
KMJ	San Joaquin Light & Power Corp., Fresno, Cal.	833	360	50
WRAB	Savannah Board of Public Education, Savannah, Ga.	833	360	100
KDYM	Savoy Theatre, San Diego, Cal.	833	360	50
WIAO	School of Engineering, and Milwaukee and Wisconsin News, Milwaukee, Wis.	833	360	100
WHN	Schubel, George, Ridgewood, N. Y.	833	360	100
WQAN	Scranton Times, Scranton, Pa.	833	360	100
WFEQ	Scroggin, J. L., Oak, Neb.	833	360	150
KDZT	Seattle Radio Assn., Seattle, Wash.	833	360	10
WHAQ	Semmes Motor Co., Washington, D. C.	1,240	242	10
KFFA	Shelton, Dr. R. O., San Diego, Cal.	1,240	242	50
WSAP	Seventh Day Adventist Church, New York, N. Y.	833	360	250
WEAN	Shepard Co., Providence, R. I.	833	360	20
WNAC	Shepard Stores, Boston, Mass.	833	360	100
WEAV	Sheridan Elect. Service Co., Rushville, Neb.	833	360	100
WLAQ	Shilling, A. E., Kalamazoo, Mich.	833	360	20
WNAY	Ship Owners' Radio Service, Baltimore, Md.	833	360	10
WDT	Ship Owners' Radio Service, Stapleton, N. Y.	833	360	500
WNJ	Shotten Radio Mfg. Co., The, Albany, N. Y.	833	360	50
KDZB	Siefert, Frank E., Bakersfield, Cal.	833	360	100
WDAU	Slocum & Kilburn, New Bedford, Mass.	833	360	50
KFFO	Smith, Dr. E H., Hillsboro, Ore.	833	360	5
KDYW	Smith-Hughes & Co., Phoenix, Ariz.	833	360	20
KNI	Smith, T. W., Eureka, Cal.	833	360	50
WGAZ	South Bend Tribune, South Bend, Ind.	833	360	100
WFAZ	South Carolina Radio Shop, Charleston, S. C.	833	360	10
WCAT	South Dakota School of Mines, Rapid City, S. D.	1,250	240	100
KFDY	South Dakota State College of Agri. and M. Arts, Brookings, S. D.	833	360	100
WSAB	Southeast Missouri State Teachers' College, Cape Girardeau, Mo.	833	360	100
KDPT	Southern Electrical Co., San Diego, Cal.	833	360	50
WOAI	Southern Equipment Co., San Antonio, Texas	833	360	500
WBT	Southern Radio Corp., Charlotte, N. C.	833	360	500
WGAR	Southwest American, Fort Smith, Ark.	833	360	20
WQAB	Southwest Missouri State Teachers' College, Springfield, Mo.	833	360	20
WOAU	Sowder Bolling Piano Co., Evansville, Ind.	833	360	10

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Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
WGAD	Spanish-American School of Radio Telegraphy, Ensenada, P. R...	833	360	500
WSAA	Sprague, B. S., Elect. Co., Marietta, Ohio	833	360	25
WFAF	Spratley, Henry C., Poughkeepsie, N. Y.	833	360	100
KFAP	Standard Publishing Co., Butte, Mont.	833	360	50
WEAB	Standard Radio Equip. Co., Fort Dodge, Ia.	833	360	150
KDYX	Star Bulletin Pub. Co., Honolulu, T. H.	833	360	50
KFHR	Star Elec. & Radio Co., Seattle, Wash.	833	360	100
WKAC	Star Pub. Co., Lincoln, Neb.....	833	360	100
KFAE	State College of Washington, Pullman, Wash.....	833	360	500
WRAC	State Normal School, Mayville, N. D.....	833	360	450
WHAA	State University of Iowa, Iowa City, Iowa.....	1,060	283	100
WBAX	Stenger, John H., Jr., Wilkes-Barre, Pa.....	833	360	50
WBAD	Sterling Elec. Co., Minneapolis, Minn.	833	360	100
WBBC	Sterling Radio Equip. Co., Sterling, Ill.....	1,310	229	50
WCK	Stix-Baer-Fuller, St. Louis, Mo...	833	360	100
WFI	Strawbridge & Clothier, Philadelphia, Pa.....	760	395	500
WPAL	Superior Radio & Tel. Co., Columbus, Ohio	1,050	286	100
WFAC	Superior Radio Co., Superior, Wis.	833	360	150
WHB	Sweeney School Co., Kansas City, Mo.	730	411	500
WNAN	Syracuse Radio & Tel. Co., Syracuse, N. Y.....	1,050	286	100
WDAE	Tampa Daily Times, Tampa, Fla...	833	360	250
WBL	T. & H. Radio Co., Anthony, Kan..	833	360	50
WRW	Tarrytown Radio Research Laboratory, Tarrytown, N. Y.....	833	360	20
WRAD	Taylor Radio Shop, Marion, Kan..	833	360	10
KDYL	Telegram Publishing Co., Salt Lake City, Utah.....	833	360	150
WNAS	Texas Radio Corp. and Austin Statesman, Austin, Texas.....	833	360	100
KFBU	Thomas, Bishop N. S., Laramie, Wyo.	833	360	10
WHAB	Thompson, Clark W., Galveston, Texas	833	360	100
WRAR	Thomas, Jacob Carl, David City, Neb.	833	360	20
KFKH	Thomas Musical Co., Marshfield, Ore.	833	360	10
KFIJ	Thoreau, Sidney I., Platte, S. D....	1,270	236	5
KHJ	Times Mirror Co., Los Angeles, Cal.	760	395	500
WFAM	Time Publishing Co., St. Cloud, Minn.	833	360	20
WMAL	Trenton Hdwe. Co., Trenton, N. J.	1,170	256	15
KDYS	Tribune, Inc., The, Great Falls, Mont.	833	360	250
KLX	Tribune Pub. Co., Oakland, Cal....	833	360	250
WDAH	Trinity Methodist Church, So. El Paso, Texas.....	833	360	200
WMAG	Tucker Elec. Co., Liberal, Kan....	833	360	20
WAAC	Tuland University of Louisiana, New Orleans, La.....	833	360	400
WLAL	Tulsa Radio Co., Tulsa, Okla.....	833	360	100
WKAW	Turner Cycle Co., Beloit, Wis....	1,240	242	10
WOAF	Tyler Commercial College, Tyler, Texas	833	360	20
WRL	Union College, Schenectady, N. Y..	833	360	500
WJAX	Union Trust Co., Cleveland, Ohio..	770	390	500
WKAH	United Battery Service Co., Montgomery, Ala.	1,330	226	20
WAAP	United Elec. Co., Wichita, Kan....	833	360	150
WPO	United Equip. Co., Memphis, Tenn..	833	360	50
KFDH	University of Arizona, Tucson, Ariz.	833	360	250
KQI	University of California, Berkeley, Cal.	833	360	250
WHAG	University of Cincinnati, Cincinnati, Ohio	1,350	222	100
KFAJ	University of Colorado, Boulder, Colo.	833	360	100
WRN	University of Illinois, Urbana, Ill..	833	360	500
WLB	University of Minnesota, Minneapolis, Minn.	833	360	150
WAAN	University of Missouri, Columbia, Mo.	833	360	55
WFAV	University of Nebraska, Lincoln, Neb.	833	360	100
WNAD	University of Oklahoma, Norman, Okla.	833	360	100
WHAM	University of Rochester, Rochester, N. Y.....	833	360	100
WEAJ	University of South Dakota, Vermillion, S. D.....	833	360	200
WCM	University of Texas, Austin, Tex...	833	360	500
WCAX	University of Vermont, Burlington, Vt.	833	360	100
WHA	University of Wisconsin, Madison, Wisc.	833	360	250
WSAI	U. S. Playing Card Co., Cincinnati, Ohio	970	309	500
WMAP	Utility Battery Service, Inc., Easton, Pa.....	1,220	246	50
WCAB	Valley Radio, Grand Forks, N. D...	833	360	20
KFHD	Utz Electric Co., St. Joseph, Mo...	1,330	226	10
WOAN	Vaughan, James D., Lawrenceburg, Tenn.	833	360	150
WLAK	Vermont Farms Mach. Co., Bellows Falls, Vt.....	833	360	500
WSAV	Vick, Clifford W., Houston, Tex...	833	360	100
WGAM	Villanova College, Villanova, Pa..	833	360	100
KFAY	Virgin's Radio, Medford, Ore....	833	360	50
WLAJ	Waco Electric Supply Co., Waco, Texas	833	360	50
WMAW	Wahpeton Elect. Co., Wahpeton, N. D.....	833	360	10
WDAS	Waite, Samuel A., Worcester, Mass.	833	360	30
WWZ	Wanamaker, John, New York, N.Y.	833	360	100
WOO	Wanamaker, John, Philadelphia, Pa.	590	509	500
WPAR	Ward, R. A., Beloit, Kan.....	833	360	10
KLS	Warner Brothers, Oakland, Cal....	833	360	50
KHQ	Wasmer, Louis, Seattle, Wash.....	833	360	100
WMAR	Waterloo Electrical Supply Co., Waterloo, Iowa.....	833	360	50
KFJD	Weld County Printing & Pub. Co., Greeley, Colo.....	1,270	236	100
KFBD	Welch, Clarence V., Hanford, Cal.	833	360	10
KZV	Wenatchee Battery & Motor Co., Wenatchee, Wash.....	833	360	50
WQAQ	West Texas Radio Co., Abilene, Texas	833	360	60
WHD	West Virginia University, Morgantown, W. Va.....	833	360	250
WBAY	Western Elec. Co., New York, N.Y.	610	492	500
KFAF	Western Radio Corp., Denver, Colo.	833	360	500
WOQ	Western Radio Co., Kansas City, Mo.	833	360	250
KFCY	Western Union College, LeMars, Iowa	833	360	100
KYW	Westinghouse Elect. & Mfg. Co., Chicago, Ill.....	870	345	500
KDPM	Westinghouse Elect. & Mfg. Co., Cleveland, Ohio.....	1,110	270	250
KDKA	Westinghouse Elect. & Mfg. Co., East Pittsburgh, Pa.....	920	326	1,000
WEZ	Westinghouse Elect. & Mfg. Co., Springfield, Mass.....	890	337	600
WQAD	Whiteall Elect. Co., Waterbury, Conn.	1,240	242	50
WJH	White & Beyer Co., Washington, D. C.	1,100	273	50
WJAK	White Radio Laboratory, Stockdale, Ohio	833	360	60
WEAH	Wichita Board of Trade & Landers Radio Co., Wichita, Kan..	833	360	100
WPAD	W. A. Wieboldt & Co., Chicago, Ill.	833	360	100
WCAS	Wm. Hood Dunwoody Industrial Inst., Minneapolis, Minn.....	833	360	200
WHAV	Wilmington Elect. Specialty Co., Wilmington, Del.....	833	360	50
KFEI	Winner Radio Corp., Denver, Colo.	833	360	150
WHAP	Winter Park Elect. Const. Co., Winter Park, Florida.....	833	360	20

(Continued on next page)

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The Radio Woman

SOME women just can't help being meddlesome. Here's a friend of mine who never will know anything about radio "butts in" on her husband's plans and makes herself perfectly ridiculous. It seems he had planned to take his radio set to their Adirondack camp for the summer and had spent several evenings checking up a list of spare parts he might need. His wife saw the list and brought to bear on it her half-baked knowledge of radio lingo. She decided the list wasn't complete and hied herself to the nearest radio supply store. Then she made this speech to the astonished clerk: "We're going to take our radio set up to our camp for the summer and, with it, a lot of spare parts. My husband has made a list, but he's forgotten something. I'm going to help him out and I want you to measure me off two 450 meter waves, so that if one breaks we'll have another on hand!" Isn't that the limit? The clerk told

(C. Kadel & Herbert)
Baby Ralph Breslin listens while mother prepares the muffins.

the husband, he told my husband, he told me and now I'm telling you. I hope my woman friend buys this issue of RADIO WORLD—and reads it!

* * *

I've been reading a lot lately, it seems to me, of how carefully tubes must be mounted to prevent jarring and breaking the filaments when the set is moved about. In one of the big department stores the other day I saw some sports shoes with soles of what they called "crepe rubber." It was about half an inch thick and very spongy in appearance and feeling. Why not make pads of this crepe rubber and mount the tubes on them?

Changes in Broadcasting Stations

ELEVEN new Class A stations were licensed by the Department of Commerce during the past week, eight Class C stations transferred to Class A, and two transferred from Class C to Class B.

SUPPLEMENTAL LIST OF LIMITED COMMERCIAL BROACASTING STATIONS

Call	Station	Frequency Keys.	Wave Length Meters	Power Watts
K F J A	Central Power Co., Brand Island, Neb.	1230	244	100
K F K A	Colorado State Teachers' College, Greeley, Col.	1210	248	50
W A B L	Connecticut Agri. Col., Storrs, Conn.	1060	283	100
W A B K	First Baptist Church, Worcester, Mass.	1190	252	10
W S A D	J. A. Foster Co., Providence, R. I.	1150	261	50
W T A G	Kern Music Co., Providence, R.I.	1160	258	10
W D B C	Kirk Johnson & Co., Inc., Lancaster, Pa.	1160	258	50
K F J B	Marshall Elect. Co., Marshalltown, Iowa	1210	248	10
K F L E	National Educational Service, Denver, Col.	1120	268	10
W T A K	Swan-Bower Co., Steubenville, Ohio	1130	266	20
K F I L	Windisch Elect. Farm Equip. Co., Louisburg, Kan.	1280	234	100

TRANSFER CLASS C TO CLASS A

W O A K	Collins Hardware Co., Frankfort, Ky.	1250	240	10
W D A I	Hughes Radio Corp., Syracuse, Syracuse, N. Y.	1220	246	100
K F F B	Jenkins Furniture Co., Boise, Idaho	1250	240	10
W C A G	Randall, Clyde R., New Orleans, La.	1120	268	50
W E W	St. Louis Univ., St. Louis, Mo.	1150	261	100
K F F O	Smith, Dr. E. H., Hillsboro, Ore.	1310	229	5
W Q A B	Southwest Missouri State Teachers College, Springfield, Mo.	1270	236	10
W A A N	University of Missouri, Columbia, Mo.	1180	254	50

TRANSFER CLASS C TO CLASS B

W L W	Crosley Mfg. Co., Cincinnati, Ohio "B"	970	309	500
W D T	Shipowners' Radio Service, New York "B"	740	405	500

(*Continued from preceding page*)

Call	Station	Frequency Keys.	Wave Length Meters	Power Watts
WBAN	Wireless Phone Corp., Paterson, N. J.	1,230	244	100
WNO	Wireless Telephone Co., Jersey City, N. J.	833	360	15
WPAH	Wisconsin Department of Markets, Waupaca, Wisc.	833	360	800
WNAP	Wittenberg College, Springfield, O.	833	360	100
WKY	Radio Shop, Oklahoma City, Okla.	833	360	100
WFAB	Woese, Carl C., Syracuse, N. Y.	1,280	234	200
WOAX	Wolff, Franklyn J., Trenton, N. J.	1,250	240	100
WOAW	Woodmen of the World, Omaha, Neb.	833	360	50
WOAL	Woods, Wm. E., Webster Grove, Mo.	833	360	500
WIAY	Woodward & Lothrop, Washington, D. C.	833	360	50
WLAH	Woodworth, Samuel, Syracuse, N.Y.	1,280	234	250
WWAX	Wormser Brothers, Laredo, Tex.	833	360	100
WEAP	Wortham Carter Pub. Co., Fort Worth, Tex.	630	476	500
WWAD	Wright & Wright, Inc., Philadelphia, Pa.	833	360	200
WKAF	W. S. Radio Supply Co., Wichita Falls, Tex.	833	360	100
WAAY	Yahrling Rayner Piano Co., Youngstown, Ohio	833	360	100
KFIQ	Yakima Valley Radio Broadcasting Association, Yakima, Wash.	1,240	234	50
WJAJ	Y. M. C. A., Dayton, Ohio	833	360	50
KDA	Y. M. C. A., Denver, Colo.	833	360	1KW (1,000)
WABE	Y. M. C. A., Washington, D. C.	1,060	283	50
WKC	Zamoiski Co., Jos. M., Baltimore, Md.	833	360	50
WIAE	Zimmerman, Mrs. Robert E., Vinton, Iowa	833	360	40

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How to Make a Single Circuit Regenerative a Phantom Receiver

By Leon W. Bishop 1XP

ONE of the most interesting and spectacular circuits for a single tube may be constructed for vacation use and may be used in a car or at camp and requires little or no aerial. The circuit is an adaptation of the two Armstrong principles and it really produces distance and clarity for a small constructional cost.

The success of any circuit depends upon the constants, particularly this one which would seem to be a standard regenerative circuit but is completely changed by a large tickler and variable grid leak.

This circuit has been designed for the new wave bands of 2,000 to 550 kilocycles (150 to 545 meters) which includes the amateur. The circuit is more efficient on the shorter wave bands so it is possible to get the Class B stations as loud as the Class A stations which is not possible with other types. Due to great flexibility the circuit will work equally well on phone, CW, ICW, and spark which will insure all classes of service no matter where located.

When using this one tube circuit in a car with a four foot aerial it is equal to a three stage radio-frequency amplifier and detector. Due to the short aerial used it is possible to receive through bad QRN and for this reason alone is of considerable value during the summer months.

The best tubes to use are the UV 199 and UV 201-A. The rheostat should be that resistance advised by the makers of the tubes. The B battery can be anywhere from 45 to 90 volts but maximum results will be obtained at about 65 volts. The two fixed condensers .00025 and .002 should be of the mica type. The variable condenser should have from 17 to 23 plates (.0003 to .0005 MF).

The variable grid leak is important and should be variable over a range of from 50,000 to 5 megohms. Several commercial types that were tried did not have the range they claimed so it might be advisable to build your own and for that purpose purchase a ten cent roll of Dennison's black picture binding paper tape whose dull black surface is slightly conducting and can be readily lowered with an extra soft lead pencil. This grid leak can be arranged with a sliding arm or switch and contacts but it must be variable over a wide range and capable of fine adjustment.

Like the grid leak the coupler is of special design and the following values should be adhered to. The best combination to use is the rotor and stator of a standard coupler wound as follows: The tube (stator) should be wound with as large a wire as possible starting with 20 turns on the rotor side of the tube and tap off every ten turns until you reach 120 turns which will leave 11 taps.

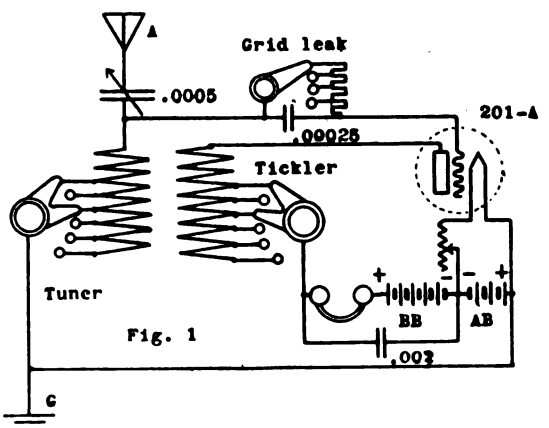
The rotor is also a real job for it is tapped in a similar manner. Start on one side of the rotor with 40 turns and tap off every 10 turns until you have wound on 120 and you will have nine taps. These taps can be passed through the rotor shaft to switch points on the panel or a switch may be mounted on the rotor. Fine wire may be used on the rotor to accommodate the 120 turns necessary.

A warning is issued against the use of shellac on the windings. Firm windings may be obtained by drilling holes at each tap off and binding the wires in them.

Do not use honeycomb coils. Either double or single switch arms may be used. The 180 degree type of coupler can be used. Do not tap the coils any coarser than 10 turns but finer if anything.

The best antenna or collector system is to connect the variable condenser at point A of the diagram to a good ground. No other connection is necessary. There are five adjustments on the set—1, the grid tuning coil; 2, the tickler coil; 3, the coupling between these coils; 4, the variable grid leak; and 5, the variable condenser.

As the tickler coil and grid leak are increased a regenerative condition will be met, which is denoted by a high pitched whistle, the pitch of which can be varied by the grid leak and should be adjusted until it is above the point of audibility and only a slight hiss is heard in the phones. At this point a wonderfully sensitive condition exists for all classes of phone and



Comprehensive circuit diagram illustrating a good single circuit "phantom" receiver.

CW and will tune in contrastingly clear as compared with any single tube circuit.

A given wave length is tuned in by means of the variable condenser and grid circuit tuning coil. The tickler and grid leak are merely adjusted to conform to this condition. The resistance of the grid leak should be so arranged that it will give out a bad screech as it is increased and follow through an intermediate series of pure notes until it passes out of audibility with a range of adjustment on either side.

The right polarity of the tickler coil in the plate circuit will have to be tried out by reversing the leads until the best results are obtained.

This is a standard circuit and may be used as such with an aerial and ground by reducing the tickler coil turns with the switch. With an aerial and ground the circuit can be used for transmission with a power tube and increased B voltage. All classes of super results may be obtained which makes it an ideal vacation outfit.

There are several aerial combinations that work well. One of the most interesting is to connect the point G to ground and touch the moistened finger to point A. For apartment houses two combinations can be used—connect the point G to ground and the point A to some metal object or a small aerial in the room, or connect just the point A to ground.

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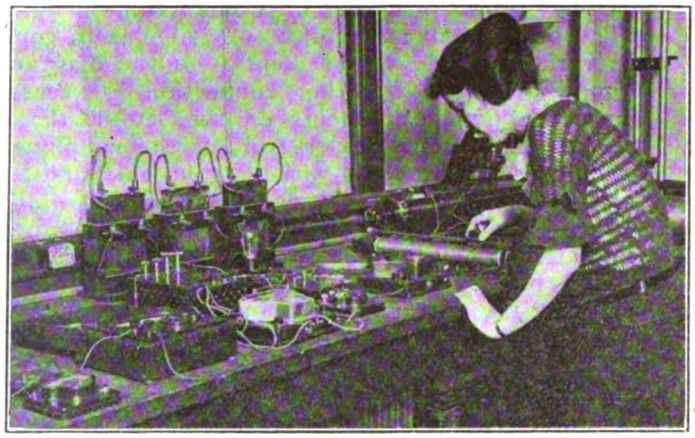
Of the Myriad Interesting Radio News Are Typi

BARNARD GIRLS ENJOY RADIO RESEARCH

The Department of Physics of Barnard College, New York, has some of the most interesting radio research apparatus and laboratories in the city. The most interesting and intriguing part of it is that the course is for girls alone, and that they are studying this research work as a part of their regular college work, and will be graduated with the degree of R. E.

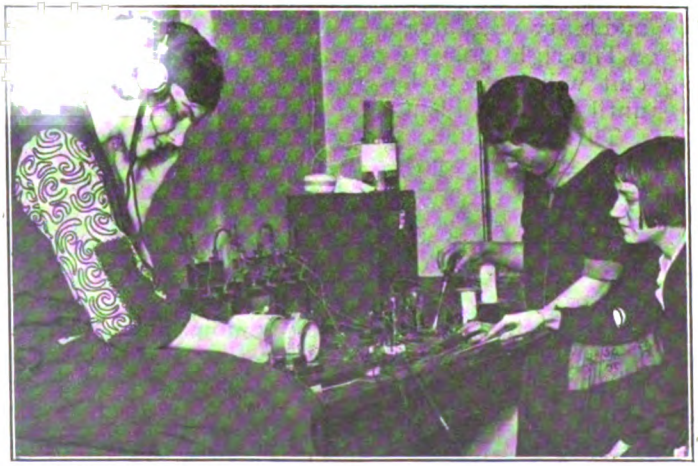


(C. Kadel and Herbert)
Miss Irene Bowman, class of '23 of Barnard College, determining the operating characteristics of a U. V. 201. The most up-to-date laboratory research apparatus is necessary and is used.

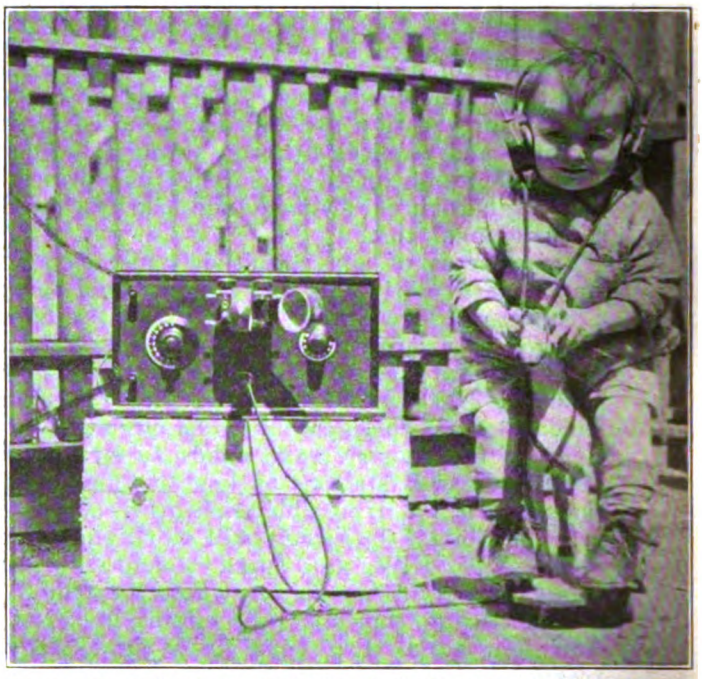
The course is a most extensive and practical course and takes in the theory and actual practice of radio. The girls have a very complete laboratory, where they can work out all the problems and prove out to their own satisfaction the deep, deep theories of all the master minds of the radio profession.

To give a slight idea of the extensive work that they are doing, just look at the illustrations and see them studying tube characteristics and work out neutralizing capacities for different styles and types of tubes. It is deep stuff, but interesting, and watch them go when they can tell the profession that they are full-fledged R. E's.

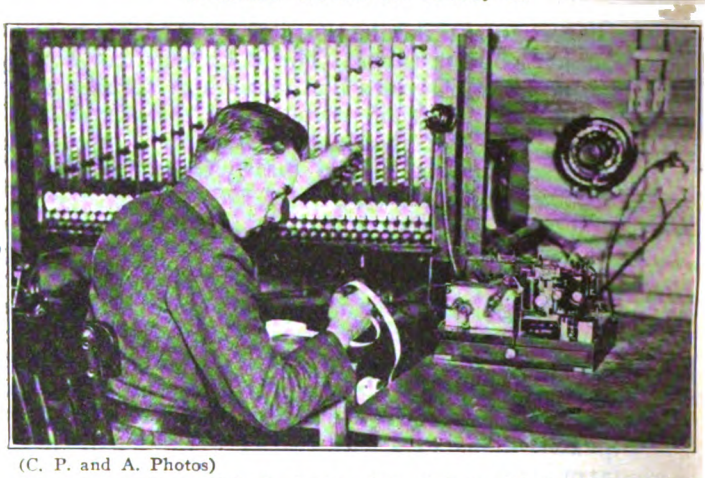
Captions by Robert L. Dougherty



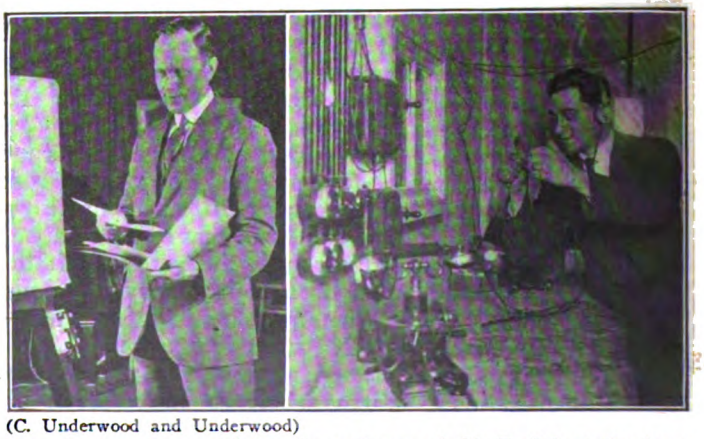
(C. Kadel and Herbert)
Miss Olive Gunn, class of '24; Miss Ruth Bass, class of '26; Miss Barbara Collison, class of '26, and Miss Lillian Willson, class of '26, studying the effect of neutralizing capacities on the operating characteristics of a three tube set.



Master Henry Pavel, Jr., of Astoria, L. I., has taken such a liking to Daddy Pavel's radio set that he has to have it out in the play yard in the garden with him. Although only a beginner in the art, he is a "mean dial twister," and would rather hear Uncle Roxy than twist the cat's tail, which is some reformation. The set used is the Sorenson circuit described in RADIO WORLD for January 20.



(C. P. and A. Photos)
Apparatus at Camp Vail, N. J., by which it is possible for the students of telegraphy and radio to quickly see their faults by comparing their transmission with one that is machine sent and perfect. This is possible by comparing the two which are recorded on a moving tape. There are 115 men and officers at this camp devoting their time to radio and signal corps work.



(C. Underwood and Underwood)
How the control man informs the performer of this English station how the music is being transmitted. A window communicates between the studio and the operating room, and visible signals are used as shown. Wonder if "thumbs down" means show emotion or run?

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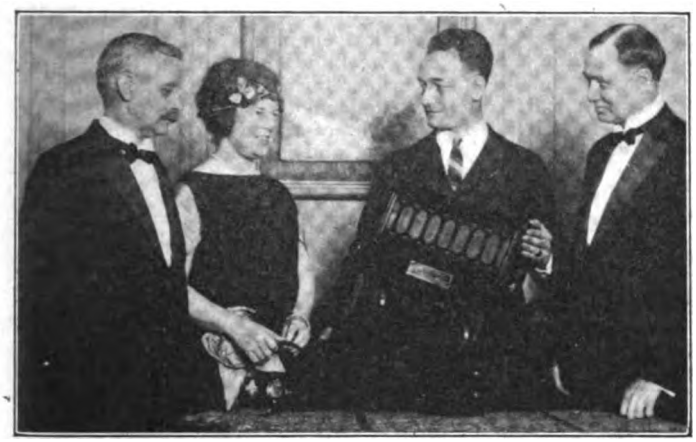
s Events Constantly Occurring These ypical

(C. Keystone View)
It's perfectly wonderful getting your boots slicked up in this shine parlor, if you live in San Francisco. But don't possess a pair of "musical ankles" if they start in to broadcast a good lively jazz while trying to get a shine for church.



(C. Photonews, N. Y.)
Edith Bennet, American concert star, was presented with a full-fledged and complete radio set at the Hotel San Remo when a banquet was held in her honor. The set was donated on behalf of Miss Bennet's efforts for the unseen radio audience some time ago, when she sang the first concert broadcast across the Atlantic.

(C. Kadel and Herbert)
Instead of the usual sleeping potions and drugs they are now serving neurotic patients in all the big hospitals and sanatoriums with a light dose of fresh caught radio music and talk. Doctors claim that it quiets the nerves and soothes the patients much better than the usual harmful habit forming drug. Even nurses like it.

WHN IS A POPULAR STATION WITH THE FANS

The call letters of this station have been heard far and wide despite the fact that it is a comparatively low-power station among a forest of high-powered brethern. This station, although using only 200 watts output, can claim the distinction of being heard in Cuba and Panama, and

(C. Kadel and Herbert)
Chief Operator F. W. Boettcher doing his "daily dozen" in adjusting and checking the wave length of Station WHN, well known and liked by the many listeners.

it is through the co-operation of the studio and the people in the surrounding territory that WHN has gained the name of "One of the most popular broadcasting stations in the East."

The accompanying illustrations show the personnel of the station that tend to make this station more and more popular through combining the public's wishes with their programs and making the people feel that they have a personal interest in WHN.

(C. Kadel and Herbert)
Staff of WHN. Left to right: Robert Pierce (late of WJZ), Mrs. Catherine Chute, Charles Reed Jones, Miss Pauline Kinkel, F. William Boettcher (Chief), Miss Adeline Rabe, Louis F. Mueck. Sitting: Madeling Jonk, Carl Klemmens. Up above the crowd is J. L. White.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

A man's home is no longer his castle—it's his receiving station. —Exchange.

* * *

The Goldman band concerts in Central Park, New York City, will be broadcast this summer.

* * *

A lady asserts that she never saw the man she is said to have married, but what does that prove in the Age of Radio?—*New York Times.*

* * *

Irving Langmuir, of the General Electric Company's Research Laboratory, has received the degree of Doctor of Science from Union College, Schenectady, N. Y.

* * *

A feature of Children's Day, which was celebrated by hundreds of churches, was the broadcasting of a full "Children's Day Service" from Station WJZ in commemoration of the golden jubilee of the occasion.

* * *

Edward Lind Morse, artist, author and son of Samuel Finley Breese Morse, inventor of the telegraph, died last week at his home in Pittsfield, Mass., at the age of sixty-six. His portraits and landscapes are in many American art museums. His principal literary work was "Samuel F. B. Morse, His Life and Letters."

* * *

Max Graf, president of Graf Productions, Inc., has found a new way to get in touch with the theatre-going public. It's via radio, and last week the producer spoke to the public from WJZ in the Aeolian Building, New York City. His idea, Mr. Graf explained, was not to get publicity, but to ask all those listening in on his speech to write him what they wanted in motion pictures.

* * *

The dancing which followed the recent Shriners' pageant in Washington, D. C., was intended to represent "a united country in step." The music was broadcast by radio throughout the continent and was carried to the thousands of participants through amplifiers along Pennsylvania Avenue. Each block was set aside for a State, and the spectators along the line were invited to join the 140,000 Shriners and their visiting companions in the festival.

* * *

Holger H. Hansen, of "El Ejemplo," Humacao, Puerto Rico, sends to RADIO WORLD a clipping of a public notice signed by Governor Henry H. Hough of the Virgin Islands, reading as follows: "It is hereby brought to public notice that, in pursuance of the provisions of the ordinance approved 28 May, 1910, it is unlawful to establish or maintain a radio or wireless station, public or private, in the Virgin Islands of the United States without the express authorization of the Governor of the Virgin Islands of the United States of America. Violations shall be punishable as prescribed by Chapter I, Section 6, of the ordinance above mentioned."

* * *

It is the plaint of scientists that the public seldom recognizes their work until that work takes on some spectacular aspect, and the reproach is possibly justified, observes a writer in the New York *Times.* It causes them to be reticent with regard to their achievements for fear that the true significance of them may be lost in the attempt to impress them upon the public's mind by some vivid detail. But in the last few years the increasing interest in science because of its close relation to every-day life, the growing knowledge of its service to mankind, has brought about a greater recognition of men whose work was unknown a short time ago except to their associates.

* * *

Thomas Alva Edison attended the graduating exercises of the Massachusetts Institute of Technology at Cambridge, Mass., last week. His son, Theodore Miller Edison, was a member of the graduating class to receive the degree of Bachelor of Science. When asked if he would give his son a job without requiring him to answer one of the famous questionnaires, Mr. Edison is quoted as saying: "My son is a physicist and mathematician, and I am no mathematician. If his mathematics are not too professional he can work with me, but if his mathematics shoot off in the Einstein direction he'll be practically no use at all." Asked why he allowed his son to go to Tech, Mr. Edison is reported to have said: "There is some hope for men who come out of Boston Tech. When they come out of Harvard, Yale and other colleges they 'leave all hope behind.'"

Gerard Swope, president of the General Electric Company, received the honorary degree of Doctor of Science from Rutgers College at the recent annual commencement.

* * *

British authors, playwrights and composers have decided they will not permit the broadcasting of their works by radio unless they receive payment for the use of the material.

* * *

Radio communication is rapidly being adopted by Western power companies as a means of maintaining communication with their distant power plants when wire lines are inoperative.

* * *

Governor Smith of New York last week gave an account of his stewardship and explained in detail the various appropriations he has approved. His statement was broadcast in full from Station WGY, Schenectady, N. Y.

* * *

A fund for the purchase of a library devoted to the science of radio has been established at Yale University by Dr. Lee De Forest, who is a Yale graduate. Dr. De Forest has also established a fund for a course of thirty lectures by radio experts for the benefit of the engineering staff.

* * *

Dr. Louis Bell, widely known electrical engineer, died at his home in West Newton, Mass., last week. He organized the course in electrical engineering at Purdue University, was editor of the "Electrical World" two years and chief engineer of the Electric Power Transmission Department of the General Electric Company three years. He designed and installed the first polyphase power plant in this country.

* * *

A British explorer named Buchanan and his party of Arab natives were among the hills of the Sahara Desert when he slipped and fell nearly 100 feet, sustaining bad bruises and internal injuries. Natives carried him fifty miles to the nearest wireless station, a far-flung outpost of the French, over 500 miles from civilization. By wireless the French got in touch with doctors at Algiers and ascertained how to treat Buchanan. Three days later he and his party resumed their march.

* * *

In an effort to decrease governmental radio interference, a special committee composed of members of the Interdepartmental Advisory Committee on Radio has made a study of wave frequencies used by the government, and recommended certain changes to the Department of Commerce. In view of this Secretary Denby, of the Navy, has requested that a complete survey of all government radio activities be now undertaken by this committee so that complete co-operation and co-ordination may be had.

* * *

Chandler Goldthwaite, the brilliant young American organist, who for the last two years has been at the console of the St. Paul Municipal Auditorium organ and enjoys the distinction of having played to the largest audience in the world, sailed for Europe recently. Before leaving on his European concert tour, Mr. Goldthwaite played several Sunday night radio organ recitals which were broadcast from the studio of the Skinner Organ Company, New York City, through Station WEAF.

* * *

High voltage experiments were conducted at the Pittsfield, Mass., laboratories of the General Electric Company last week during which a realistic electrical storm was manufactured for visiting engineers and newspaper men. All were duly impressed as each had to sign a waiver against claims for possible injury before entering the laboratory. It is estimated that a voltage of 2,000,000 was attained, which is said to be twice that ever before employed in similar experiments. Arcs were sprung between terminals over 15 feet apart.

* * *

A program of singing and addresses was broadcast for the first time simultaneously from four widely separated stations—WEAF, New York City; KDKA, Pittsburgh; KYW, Chicago, and WGY, Schenectady, N. Y.—which were connected by direct telephone wire with the stage of Carnegie Hall, New York City, where the recent convention of the National Electric Light Association was in session. As a result many hundreds of thousands of radio fans in this country and Canada were able to listen to the singing of Miss Anna Case of the Metropolitan Opera Company and to the talk of Julius H. Barnes, president of the Chamber of Commerce of the United States. The transmission of the voices over the telephone lines was so clearly instantaneous that the four radio stations broadcast the proceedings at virtually the same second.

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Answers to Readers of Radio World

I HAVE three small De Forest honeycomb coils and two others of another make which are the largest manufactured. With the De Forest I can put them in a circuit with a buzzer or bell and make the circuit, but with the others, I cannot do this. Is this an indication of a break in the coil? Will a one-tube reflex set allow me to get WJY and WJZ on a loop with anything like fair volume?—F. N. Cash, Norwich, Conn.

This is not an indication of a break in the coil. As the larger coils have considerable resistance it is hardly possible that you could ring a buzzer or bell with such a coil in the circuit. They have thousands of feet of fine wire, and the resistance is very high. A reflex set on a loop should enable you to get the stations you desire, if it is carefully made and tuned.

* * *

Kindly advise me what materials I would need for a reflex circuit similar to the De Forest. What is the circuit used? What type R. F. transformers are used in the De Forest reflex and are same available on the market? Is it advisable to make your own transformers for this type of work? What is the tuning done with when a loop is not used and antenna and ground is used in the De Forest D7 reflex? Is this type of set selective?—Howard W. Root, Derby Line, Vt.; A. G. Morris, 967 Fulton Street, Brooklyn, N. Y.; Allen Beardsley, Arlington, Va.

The necessary apparatus for the De Forest type reflex set would consist of three radio-frequency transformers, two audio-frequency transformers, three tubes with sockets, one rheostat (single control), one potentiometer, one crystal detector, one variable condenser, one coupler, one loop and fixed condensers as specified in the diagram. The circuit used is shown herewith. The R. F. transformers that are used in the De Forest are not available as they are especially manufactured for these sets. It is decidedly cheaper to buy your transformers than to make them, as the product that you buy is as perfect as research work and skilled workmen can possibly make them. It takes more than a knowledge of how to wind them, as various factors such as the internal impedance of the tubes and various other technical details have to be considered, and a home-made transformer could not be any more than a makeshift unless all the data was worked out before hand as it is done in the laboratories. In this set when the loop is withdrawn from the jack, it automatically connects the secondary of a tuner in the circuit, and the set can then be tuned by means of an ordinary variocoupler and the secondary condenser. This set is highly selective and the tuning on it is very sharp.

* * *

In RADIO WORLD *for February 10 you published an article concerning the making of a spiderweb coil tuner. Will paper forms be permissible to wind these on? The forms are to consist of thin white paper fastened together with clear varnish. Why is not slate used for forms such as this in radio work?—W. A. Bond, Hotel Irving, Greenwood, Miss.*

Would suggest that you use cardboard formers instead of white paper varnished as you mention. Paper would not have sufficient body to support the coils, and winding with varnished paper as you suggest would have a tendency to give a capacity effect between turns of the winding. The best material for this purpose is either thin mica sheeting, fibre board, bakelite sheeting, or heavy cardboard impregnated with wax or paraffine. Slate is not suitable for two reasons. The first is its working qualities and the second is that it is not a good insulator of high frequency currents. Slate is extremely brittle and hard to cut and shape, and using it for formers in such a winding would lead to innumerable troubles in the cutting and drilling. Don't court trouble in trying to work slate unless you have ample stone cutting facilities and experience in working this material.

* * *

In the June 2 issue of RADIO WORLD *you published a hook-up of a single tube reflex circuit using two RF transformers without description or specification as to what ratio or make to use. Kindly let me know.—R. B. Bannard, Hyde Park, Mass.*

If you will refer to the diagram you will see that there is one **audio-** and one **radio-**frequency transformer used. They are labeled AFT and RFT. The audio-frequency is shown as a metallic cored transformer and the radio-frequency as an air core transformer. We cannot specify any make of transformers in our descriptions or articles. Buy the best you can afford and be satisfied that your results will be good. As stated numerous times before, "cheap apparatus gets cheap results—good apparatus satisfies."

* * *

In RADIO WORLD *for May 19, R. N. King writes an article entitled "The Pup drags It In" and gives a list of stations heard on the set. What issue did this circuit appear in?—A. R. Gurnett, 64 Hallam Street, Toronto, Canada.*

This circuit appeared in RADIO WORLD for May 5 on page 7 with a complete description and panel layout.

* * *

Can results from the U. V. 199 tubes be expected to equal those of the old 200 or 201 tubes as detector and amplifiers? I am using these tubes in my set as detector and amplifier. With the use of 45 volts on the plate a decided decrease in filament supply is noted and the results obtained are nowheres near my old set. What can I do to remedy it?—Kenneth H. Jones, London Mills, Ill.

Under proper usage, these tubes will give wonderful results. The volume obtained when they are used as detectors is very near that when the U. V. 200 or 201a is used. Extremely careful operation of the filament rheostat is necessary to obtain the best results. When too much current is used, the volume of the received signals falls off appreciably. You should supply the filament current to these tubes through a 30 ohm rheostat in order to get correct filament current, and even then a fine vernier control is necessary. When these tubes are used as an amplifier a grid bias battery is necessary in the grid lead. This can consist of three cells of a flashlight battery in series for the first step, and two such units of three cells, or six cells in series for the second step. This has been found necessary when using these tubes as amplifiers and your volume will be found to increase greatly if it is done. As before stated, the filament current is very critical. This applies to the amplifiers as well as detectors. If your tubes work better with less B current at the amplifier it is perfectly O. K. to use less, but the fact that you have to decrease your filament current when 45 volts are used points out the fact that you are using too much filament current. Watch this point very carefully before getting impatient with your tubes.

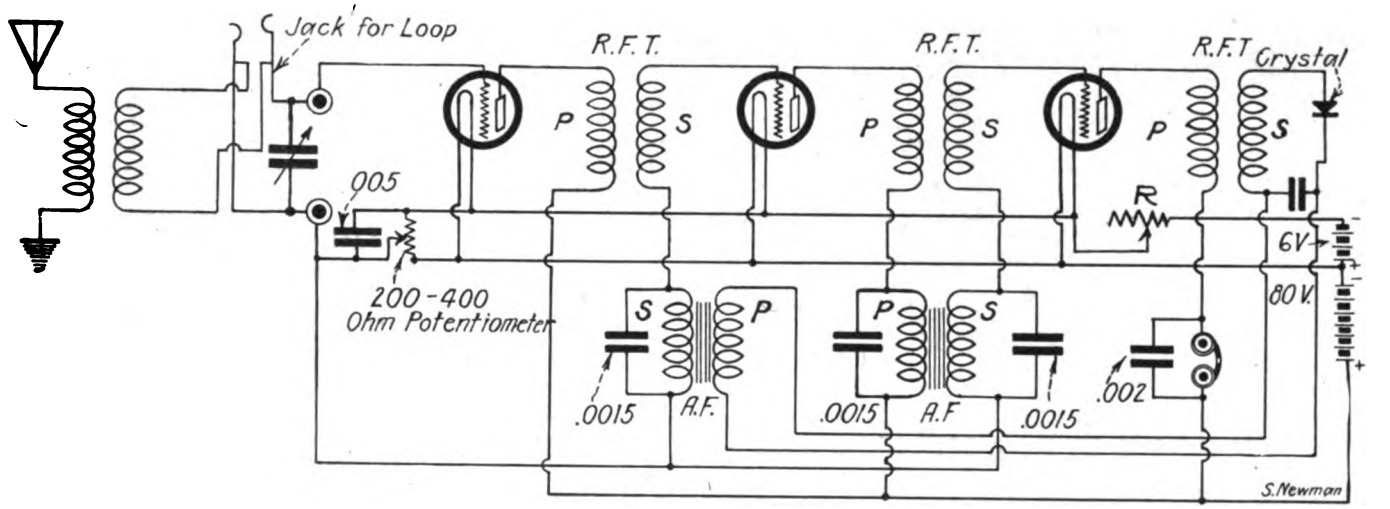

Diagram of the reflex circuit used in the De Forest D7 combination and antenna-ground receiver. When assembling a set of this type extreme care should be taken. A reflex circuit due to its action and construction will often not operate because some simple minor detail has been overlooked. If your circuit does not work, you may be sure that something has been done wrong in the construction and the fault is not in the circuit. Follow the diagram exactly, solder your leads and make them as short as convenient and be assured of success. Don't experiment with your own ideas.

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Latest Radio Patents

Radio Receiving Apparatus

No. 1,455,141: Patented May 15, 1923. Patentees: P. D. Lowell and F. W. Dunmore, Washington, D. C.

THIS invention relates broadly to radio telegraph and telephone receiving apparatus and more particularly to a circuit arrangement for such receivers.

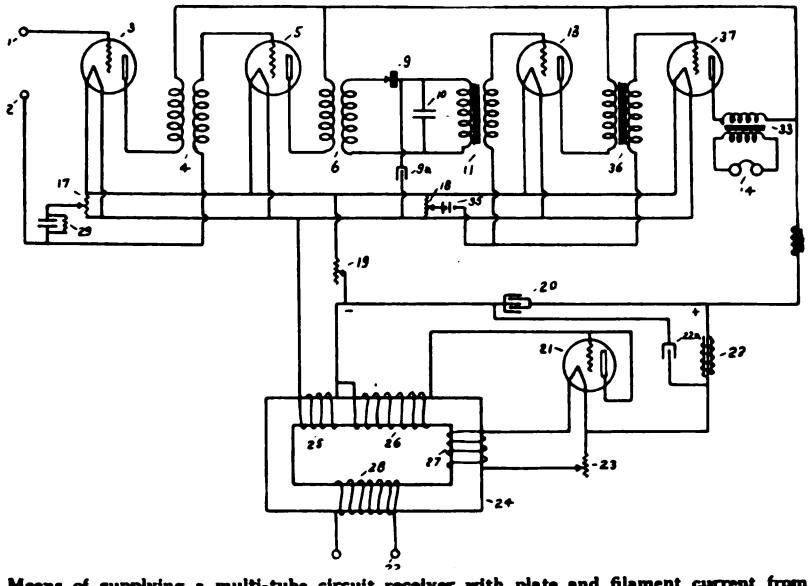
The object of the invention is to provide a receiver unit of maximum sensitivity employing thermionic vacuum tubes with their circuits supplied with energy from the standard alternating current residence lighting power.

Another object of the invention is to provide both radio and audio frequency amplification at the receiver and means for energizing the power circuits of the amplifier stages from the standard alternating current residence lighting power without interference in the reproducing receivers from the hum of the alternating current power supply.

A further object of the invention is to provide a circuit arrangement for a receiver wherein both the radio and audio frequency currents are amplified by means of electron tubes, a crystal detector used as a rectifier, the necessary filament and plate voltages being supplied by the standard alternating current residence lighting power, the residual hum in the telephone receivers being balanced out or neutralized by means of voltage dividers and other devices in the receiver circuits.

A still further object of the invention is to provide means in a radio receiver for transforming the alternating current power supply into currents suitable for the various circuits of the radio and audio frequency stages of the vacuum tube amplifiers and means for rectifying currents and obtaining a steady source of direct current potential for the plate circuits of the vacuum tubes.

Electron tube amplifiers form an important part of practically all radio receiving sets now, except the most simple types. Such amplifiers are in fact necessary to receive distant stations, or when using coil antenna. For good operation, amplifier tubes require for the filament a source of voltage of very constant value (usually about 6 volts) and for the plate a source of voltage of from 40 to perhaps 300 volts. The filament voltage is usually supplied by storage cells, and the plate voltage by dry cells. The maintenance of these cells in operating condition, especially the storage cells, is often a source of much difficulty and annoyance. The storage cells are necessarily bulky and heavy, require constant attention to maintain proper charge and density of electrolyte, give off injurious acid or other fumes and are subject to considerable variations of voltage during the period of discharge. The development of a receiver employing an amplifier which can be supplied from the ordinary 110 volt alternating current lighting mains is of considerable practical importance, since it eliminates the great practical difficulty of maintaining storage cells. The amplifier using such alternating current supply has the important advantages of reliability, convenience, and cheapness both in first cost and operating cost.



Means of supplying a multi-tube circuit receiver with plate and filament current from the commercial house current. A crystal detector is used, thereby eliminating any hum, which is further balanced out by an elaborate filter system.

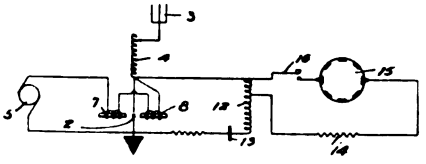
Radiotelegraph Signaling System

No. 1,454,624: Patented May 8, 1923. Patentee: Corwin C. Chapman, San Francisco, Calif.

THIS invention relates to radio signaling and particularly to single wave radio signaling.

Heretofore, signaling with continuous oscillations produced by an arc radio generator has involved the radiation of oscillations of two frequencies, one being the signaling frequency or wave, and the other being the compensating frequency or wave. Signaling has usually been accomplished by variation of antenna inductance, which variation altered the frequency of the radiated wave, so that two waves of different frequency were radiated by a station during signaling. In order to avoid interference, it was necessary to assign two wave lengths to each station and as the number of stations have multiplied, confusion and interference has been caused by the radiation of oscillations of two different wave lengths from each station.

An object of the invention is to provide a system of single wave radio signaling, in which waves having a frequency above the limit of audibility are converted into signals having a frequency within the range of audibility. The arc radio generator produces continuous waves having a frequency above the range of inaudibility, but many receiving stations are not equipped to receive and identify waves of such frequency. This invention, therefore, contemplates so manipulating the high frequency waves that signals will be received by such stations and this is preferably accomplished by converting the continuous wave into wave trains or wave groups, the frequency of the groups being within the range of audibility, so that signals so transmitted are readily received by all receiving stations. This is accomplished with the use of waves of a single frequency, thus eliminating the presence of the compensating wave. With my invention, there is utilized an absorbing oscillatory circuit in shunt with the transmitting circuit so that intermittently this shunt circuit absorbs substantially all of the energy of the source.

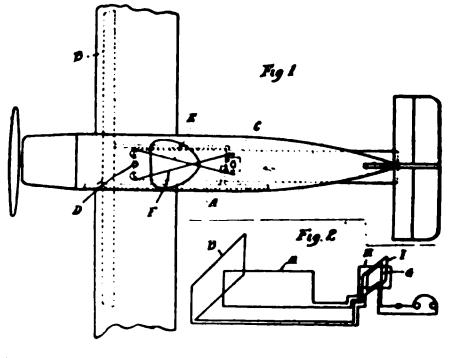


Method of using continuous waves for signaling without the necessity of generating two separate waves.

Method of Piloting Aircraft

No. 1,454,582: Patented May 8, 1923. Patentees: H. R. C. Van de Velde and J. M. Furnival, Bromley, England.

THE object of this invention is to provide improved wireless direction findings means whereby the pilot of any type of aircraft can automatically find his way. We connect the moving part of any ordinary direction finding means in which the maximum or minimum method is employed either to the rudder bar controlling the direction of flight of the aircraft or to any auxiliary attachment thereto. One method of applying the system is shown in the accompanying drawing which illustrates the standard Bellini-Tosi system. In the drawing: Fig. 1 is a plan view of an aeroplane having a direction finder in accordance with the invention. Fig. 2 is a diagrammatic view showing the angular relation of the coils of Fig. 1.



Antenna system for obtaining directional effects as applied to aircraft. A double balanced loop system is used.

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Whereas They Were Deaf, They Now Hear Again—By Radio

RADIO has broken the shell in which I have been living for forty-five years. There are something like five million people in the United States more or less hard of hearing. Only a few realize what the new discovery means to them. I'd like to go down to Wall Street and stand on the Treasury steps beside Washington's statute to preach the gospel of Saint Radio!"

That is the voice of the man who cares nothing for the process, mechanical or psychological; he wanted not reasons but results. Whereas he was deaf, now he hears. But already the Section on Otology of the American Medical Association has begun to discuss the scientific aspects of radio for the deaf and a paper read at Atlantic City a few days ago expressing a favorable view will soon be published in the medical journals as a basis for general discussion.

A powerful radio set has been placed in the headquarters of the New York League for the Hard of Hearing, at 126 East Fifty-ninth Street, and is enthusiastically used by the members, eight or ten at a time holding the ordinary telephone receivers—a temporary makeshift. Within a few weeks an elaborate installation will be completed with individual receiving apparatus for fifty auditors. The adaptation of radio to the hard of hearing is a delicate process which will take time and ingenuity to work out. But the beginning has been made.

The words of the first paragraph were spoken by Warren Pond, the newly elected President of the New York League. To get the full effect one must imagine him at his office desk—a grave, white-bearded gentleman in the early sixties—busy checking up the count of thousands of songs that lie silent on their separate shelves waiting to be sung or danced or played. The room is lined with these little honey-cells of prisoned music. Just a century ago Mr. Pond's grandfather issued the first composition way down in old New York. His father was Stephen Foster's publisher. There is something ironic in his own activity, forever sending out the notes of a music to which his ears were closed.

The look of the shop suggests years of business history. The look of the man suggests reserve. In sharpest contrast come his words—the irrepressible wonder and delight of the convert.

"My friend Fletcher here used to come in day after day and tell me the fun his boys were having with their set. I paid little attention at first, having learned by hard experience not to put myself in the way of disappointment.

"But my friends kept insisting, and finally made an appointment for me to listen in. I heard enough to decide to have a machine of my own. It had to be a powerful one—there are six tubes—and I used up the first battery in two days!

"I'm not ashamed to confess that when the set came, as I sat there and heard clearly, in my own home, the first notes of a song, the tears came to my eyes. It was the beginning of a new life.

"That was less than two months ago. In these few weeks I have had more of the pleasure of hearing than in forty-six years. When I was 15, typhoid fever left me with impaired hearing. The trouble has grown worse since."

Any one who has talked with partially deaf acquaintances on the telephone has probably noted that they hear much better than when spoken to face to face. In the receiver the vibration is intensified, the sound sharpened. But Mr. Pond long ago passed even the stage where that would help him. He does not use the telephone at all.

For necessary conversation he carries a sound-magnifying device consisting of an earpiece, a short wire and a little box to be held near the speaker's mouth. This affords too limited a contact with the world for a man with a curious, exploring, social mind.

There are two things that Mr. Pond craved with a desire comparable to hunger—music and a direct, personal, human report of other men's doings. He could read and he could go to the movies. But they left him still unsatisfied.

"I would go to concerts once in awhile," he said, "hoping to get a few of the louder strains, a little phrase of melody to remember. Last year I heard Guilbert sing—that is, I heard an occasional high note."

He was like the small boy who stands wistfully outside the baseball grounds watching the top of the celestial wall for a glimpse of the rare fly batted by an invisible hand.

"One who has good hearing can scarcely imagine the terrible effort required of us by a single concert. I have come away exhausted and suffering in all my nerves. The little pleasure won is blurred by the strain of listening.

"So you can see how many different kinds of satisfaction we get from the radio. First there is the relief of hearing without effort. Then we get the entire selection where we used to feed on scraps.

"You may think Rubinstein's 'Melody in F' is a hackneyed old thing. But it gave me the richest of thrills the other day when I heard it for the first time in years, every note, all the way through. The glorious completeness of it!

"Let me tell you what I heard last Sunday. First, the full morning service at St. Thomas's Church—hymns, anthems and sermon. In the afternoon an address by Dr. Cadman with music by the Gloria Trumpeters. An organ recital ended the day.

"Another Sunday I was present—by radio—at a service where new members were received into a church. There is a good deal of detail in such an affair and it offers a severe test. I heard everything.

"It may not sound very thrilling to the man with good ears, but try to put yourself in my place. Of course, temperaments differ widely. I suppose I care more than some folks do. There is Edison. He invents devices to help the deaf and never uses them himself.

"Of late years I have gone a few times to opera, but I heard so little that there was more fun in taking time for a good dinner. This spring I heard Martha clearly, and I'm looking forward to the orchestral concerts they will broadcast next season.

"This thing has just begun. I wish I were twenty years younger to be in on all its developments. A few weeks ago it was enough to hear the stations close by. One gets ambitious. I want to hear the surf break on the South Sea Islands now.

"Yes, it costs money if you're very deaf. But who wouldn't pawn his watch to get to the gates of Heaven? They joke about those poor fellows who make excuses to slip off to the golf links or baseball. I sneak home early myself, but some day I'll do better than that. I'll have a set installed here in the office, and when work is slack there will be no time wasted."—*New York Times.*

MAGNAVOX
Radio Products

R3 Magnavox Radio The Reproducer Supreme

Make Your Receiving Set Complete

The efficiency of the Magnavox Reproducer is due to its principle of construction.

Only the Magnavox (electro-dynamic) reproducer can re-create broadcasted programs according to their original *pitch, quality* and *volume.*

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2-stage Power Amplifier . . . **$90.00**

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The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Frank Barras, 1835 Sumdaro Blvd., Kansas City, Kans. (Manufacturer and retailer.)
Harry Rood, 526 Comerford St., Esquimalt, B. C., Canada.
Frank L. Hartzell, R. 1, Gilman, Wis.
Bruce Cole, General Delivery, Glasgow, Mont.
Milton Farber, 2866 Washington Ave., Ogden, Utah.
A. L. Lacasse, 176 Fisher Ave., Roxbury, Mass.
James E. Forr, 1212 Thirteenth St., Altoona, Pa. (Consumer.)
T. W. Austin, P. O. Box 416, Greenville, Ala.
W. L. Keifer, 430 North Sixth St., Lebanon, Pa. (Large consumer.)
G. H. Turrell, Jr., Smithtown Branch, Long Island, N. Y.
M. G. Hagerty, 403 Milock Lane, Brackenridge, Allegheny Co., Pa. (Wants a loud speaker.)
Frank K. Annis, 453 Louisiana Ave., Baton Rouge, La.
A. P. Beardsley, P. O. Box 246, Wheeling, W. Va.
Horace Ballagh, 458 Henry St., Detroit, Mich.
C. O. Palmer, General Delivery, Camp Sherman, Chillicothe, Ohio.
Delbert Westover, Arlington, Wash. (Handles radio supplies as side line.)
Eddie Smith, 688 South 39th St., Louisville, Ky.
A. Wolfson, 273 West 131st St., New York City.
L. A. Boyd, R. F. D. No. 1, Box 335, Hammond, Ind.
S. H. Cliff, 1703 Tenth Ave., Greeley, Colo.
Fred Dye, 2025 Dime Bank Bldg., Detroit, Mich. (Consumer.)
W. R. Shiner, Chamber of Commerce Bldg., New Haven, Conn.
M. H. Jones, P. O. Box 272, Oakland, Calif.
William Craig, Jr., Room 727, City Hall, Philadelphia, Pa.
Geo. H. Spies, 525 Locust Ave., Port Chester, N. Y.
W. J. Moran, 2909 Orleans St., Baltimore, Md. (Builds and sells sets.)
Robert H. Walters, Glidden, Iowa.
Charles C. Fisher, 50 South St., Westboro, Mass.
Gordon W. Fringer, 1766 Twelfth St., Milwaukee, Wis.
John C. Skuse, 634½ Winslow St., St. Paul, Minn.
William J. Rogers, 28 Willis St., New Haven, Conn.
John Shutts, Box 175, Fort Hunter, N. Y.
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Earl W. Riddell, 1925 Mt. Vernon St., Philadelphia, Pa.
Gordon Stewart, 38 Albert St., St. Catharines, Ont., Canada.
Arthur L. Straight, 203 Carnation St., Pawtucket, R. I.
Louis B. Wood, 103½ South Grand Ave., Lansing, Mich. (Designs, repairs, dealer.)
Lee Friedman, 1755 East 31st St., Cleveland, Ohio.
Walter A. Thomas, Genesee, Idaho.
A. K. Rittenberg, 153 Vendome Ave., Montreal, Quebec, Canada.
Ralph Rambo, 30 South Morrison Ave., San Jose, Calif., (Consumer.)
Robert Langer, 444 East Vine St., Schuyler, Nebraska.
C. C. Ross, 717 Raleigh Ave., Norfolk, Va. (Consumer.)
Laurence Moran, 127 Lake Ave., Greenwich, Conn.
Henry N. Fullerton, Waterbury, Vermont.
Ottis Soudies, Lorenzo, Texas.
F. B. Otten, Box 43, Amber, Iowa.
McFadden Radio Shop, Box 15, Stafford, Kansas.
H. B. Phinny, 310 West First St., Oil City, Pa.
Russell H. Willian, Henrietta, Mo.
J. Robert Hart, 1824 East Buckins St., Frankford, Philadelphia, Pa.

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for $1.00 Radio World, 1493 Broadway, N. Y.

Following R. C. A. Injunction DeForest Changes Its Dealer Policy

HEREAFTER the DeForest Radio Telephone & Telegraph Co., Jersey City, N. J., will sell directly to the public through exclusive agents only. Information from the DeForest Company is to the effect that an injunction has been granted to the Radio Corporation of America preventing the DeForest Company hereafter from selling radio merchandise through the usual trade channels of jobber and dealer.

This injunction is said to be based on a contract made by Dr. DeForest with the American Telegraph & Telephone Company, March 27, 1917, which stipulated that the DeForest Company would sell radio apparatus for amateur and experimental use only and to users who would purchase this apparatus only for individual use, and not for purposes of resale.

Complying with the court order the DeForest Company therefore announces that it will now sell direct to the public through exclusive agents, who will accept DeForest apparatus on a consignment basis only, in accordance with an explanatory letter which was sent out by the DeForest Company toward the end of last month.

The DeForest Company is now appointing these exclusive agents all over the United States. The agents' territory will be exclusive, and the new arrangement, according to the company, presents many advantages for DeForest agents which were not possible under the old arrangements.

Date Set for New York Radio Show

J. C. JOHNSON, manager of the American Radio Exposition, announces that the next show will be held in the Grand Central Palace, New York City, from October 6 to 13, 1923. Information may be secured from Mr. Johnson.

American Radio Prices Too High for Holland

AMERICAN radio manufacturers ask too much for their radio apparatus and materials to secure the Dutch trade, according to Consul Mahin, at Amsterdam. Competition from other countries, especially Germany, is reported to prohibit Dutch interests doing business with American exporters although the demand for radio telephone sets is good in Holland.

Canary Islands Considering Wireless

VICE CONSUL PHELAN, in the Canary Islands, reports active discussion in the Cabildo Insular de Teneriffe of a proposal to establish in the near future wireless telephone stations at the various islands of the archipelago. The present cable service between the islands has been very inefficient and has given rise to the suggestion of using wireless telephony.

"Radio, the Third Year"

AN interesting booklet has just come to the reviewer's desk from P. C. Kullman & Company, of New York, entitled "Radio, the Third Year." It is a history of the growth and expansion that has come about in this most fascinating field in the past three years—from the time that wireless was spoken of, if at all, as something of a "freak" to the present, when few are without some knowledge of its wonders. Two years ago there were no broadcasting stations. Today, in the United States alone, there are nearly 600. The Kullman book contains information as to the number of radio and wireless stocks, of the various companies engaged in allied activities, and other information illustrative of the magnitude of the industry that has developed with a rapidity hardly equalled in any other line.

Radio Lines Wanted for California

Editor, RADIO WORLD—We are anxious to get in touch with manufacturers of radio equipment, especially those who desire representation and distribution of their products in this territory. We have several very good lines which we are distributing and would like to add other lines to them. Anything you can do towards putting us in touch with such manufacturers will be greatly appreciated. Thanking you for your trouble, we are, Very truly yours,

YALE RADIO ELECTRIC CO.
4816 South Vermont Ave.
Los Angeles, Cal.

Radio in Hospitals Has Therapeutic Value

IT has been demonstrated more than once that music has a marked therapeutic effect on the spirits and general morale of hospital patients. In fact, a sixty-day test with phonographs has just been completed in the wards of the New York Nursery and Child's Hospital, 161 West Sixty-first Street, New York City. It showed that the waltz is good medicine and soothing. Well chosen music will now form part of the treatment of patients in that institution.

Here would seem to be an opportunity for up-and-coming radio dealers to increase their business in receiving sets. A systematic campaign among the hospitals, especially in the larger cities, should result in satisfactory sales.

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How to Keep Dry Cells in Stock in Good Condition

DRY CELLS have become a part of the regular stock of the average radio dealer due to the fact that the dry cell tube has become popular. During the summer months quite a bit of trouble will be experienced by the dealer who carries a stock of these batteries, if certain precautions are not taken.

Due to a cell's chemical construction, it has a limited shelf life, after which it deteriorates. As the weather is getting warm a few simple rules will tend to not only increase the shelf life of dry cells, but will prevent the dealer from giving his customers batteries which will not last any length of time.

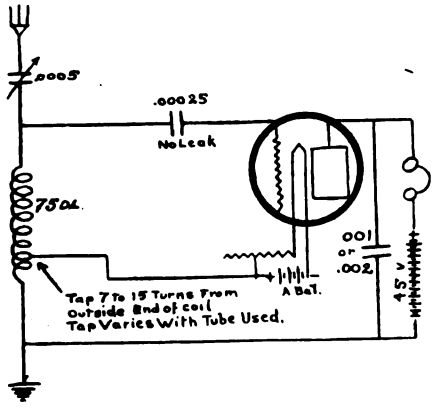
The first and foremost of these is to keep the cells in a dry place. During the summer months the humidity is high and frequently moisture gathers on the outside cover of the battery which helps to corrode the metallic lining of the battery, due to the fact that most of these metallic casings have chemicals on the outside, being handled and left in places where dampness is almost sure to collect on them.

It is most important to keep the cells in a cool place. Heat has a very noticeable effect on dry cells inasmuch as it speeds the chemical action which eats away the active elements. One dealer had a habit of keeping his cells on the topmost shelf of his store, because he thought that it was dry up there, and also "it kept them out of the way and gave an instant visual check as to whether we had them in stock." He was surprised to find out that various of his customers kept complaining that the batteries did not last any length of time, and his competitor down the street made mention of the fact that he was giving his customers old batteries. The first dealer knew that this was not so as he generally got his cells in the same shipment or at the same time that his neighbor did. He complained to the manufacturer and stated that he had had a cell in the house three weeks, sold it, and two weeks later the purchaser came back and told him that the cell was "breaking out" or was no good. The manufacturer sent a man up and he examined the dealer's stock and told him that it was a wonder that he had even kept the batteries that long. The temperature along the top shelf was 98 degrees at all times and when the heaters were going in winter or during a warm summer day it rose to as high as 110 degrees. This heat was continually wearing down the cells by speeding up the chemical action, much the same as a chemist heats a test-tube of chemicals to hasten the action, and not because the application of heat has any radical chemical effect on the constituents of the tube. Keep them cool, was the admonition of the expert, and you will keep them longer.

It is very easy for a space to be found near the floor where cells may be kept both cool and dry. If the stockroom is down below, it is much better to go to the expense of constructing a simple shelf on which to keep them off the floor and dry and cool at the same time.

A Modified "Pup" Circuit

Editor, RADIO WORLD: I have received best results with the "Pup" circuit when hooked up according to the diagram herewith. WOR was received when



Modified "Pup" circuit as worked out by Crumbaugh

weather conditions were considered bad here. You will readily see the departure from the regular "Pup" circuit.

Yours for better radio,
F. L. CRUMBAUGH.

Oskaloosa, Iowa.

Wireless Phone, Ship to Shore, in Denmark

THE United Steamship Company of Copenhagen, Denmark, plans to install wireless telephone equipment on all boats plying between Copenhagen and the provincial harbors for the traveling public's convenience. Travelers will be able to secure direct communication, through the land telephone service, with their own homes or offices similar to the service planned for the U. S. S. "Leviathan."

Radio to Be Used in Jersey Mosquito Campaign

NEW JERSEY has forty species of mosquitoes and some of them can travel at the rate of forty miles an hour, according to a statement made recently by Dr. H. H. Brinkerhoff, chairman of the Hudson County Mosquito Extermination Commission, which, he said, intended to employ radio in its 1923 war on this insect pest.

What Radio Fan Can Answer This?

EDITOR, RADIO WORLD—I am a regular reader of RADIO WORLD and like it better every time I get the latest issue. I can truthfully state that I have obtained more helpful information from RADIO WORLD than I have from all the various other radio magazines that I get. * * *

I don't remember ever seeing a column "open for discussion" in RADIO WORLD, but I am up against a proposition that I need some help on. The proposition follows:

During the week of May 14 to 20, I had my set, which is of the VT detector 2 stages AF regenerative type, installed on a steamer plying the Mississippi River. My aerial consisted of the usual two wire, inverted "L" type, about 100 feet long. This aerial was thoroughly insulated from the steamer but during the entire time that the steamer was under way there was an induced current in the aerial that was strong enough to break down from a one-quarter to a half-inch air gap. At one time while trying to tune in with the steamer under way the pilot blew a landing signal on the whistle. An extraordinary sparking, breaking down the air gaps on my 43 plate primary condenser, was observed. The sparking was correspondent to the signals, three long and one short from the whistle. There is one generator on the steamer supplying current for the lights and fans but this generator was not in operation during the day, and at night when the generator was in operation and the boat under way the induced current was not in the antenna. This same condition exists on one other steamer that I know of. The latter is equipped with wooden hull, while the one I was on was equiped with a steel hull. I would like to know *what set up the current in the aerial and what is the remedy?* I claim that it was due to the aerial cutting the magnetic lines of the earth. This has been disputed by some but so far I haven't been convinced as to the real cause. I would like to hear from any Radio Fan who has had the same experience or any that can offer a solution, as tuning in was practically impossible while the boat was under way.

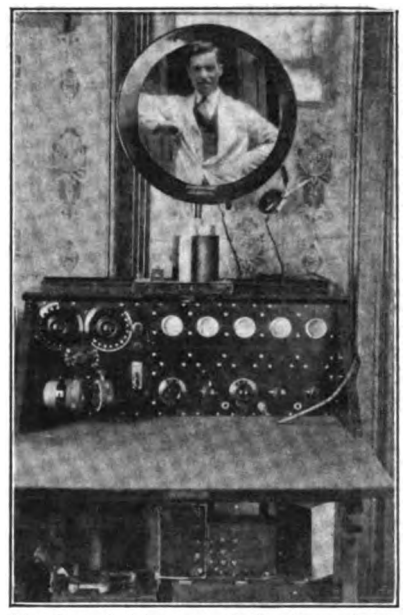
If you can enlighten me any at all on this subject I will certainly appreciate it. With best regards to RADIO WORLD and wishing it continued success,

E. M. PACE.

807 Cherry Street, Vicksburg, Miss.

A Good Home Made DX Set

EDITOR, RADIO WORLD—Some time ago I believe you said in RADIO WORLD columns that you would like to receive photos of home-made sets. Allow me to submit here-



Marchese looking out of the horn of his neat receiver

with a photo of my set which consists of two radio-frequency amplifiers, detector and two stages of audio-frequency amplification.

This set has an anti-capacity switch that cuts out the radio-frequency whenever you wish, thereby giving you the advantage of a common regenerative set. When you desire distant stations you have them by simply using the five tubes. For local work three tubes are sufficient to fill the house full of music.

The far off stations received with this set are: WSB, Atlanta: WOC, Davenport; PWX, Cuba; WDAP, Chicago; and about 50 others. Very truly yours,

STELLARIO MARCHESE.

3709 Avenue I, Brooklyn, N. Y.

"Safety First" Via Radio

Calling a man a liar over the telephone was the zenith of vicarious courage until it became possible to say, when a man is making a tedious speech over the radio, "Shut up, you big stiff!"—F. P. A. in New York World.

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THE COLUMBIA PRINT

1493 Broadway New York City

RADIO WORLD

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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

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DURING the last ten years commercial companies developed automatic printing telegraph equipment for the transmission over land wires of typewritten characters from one point to another. The present means of copying signals with the tape required the employment of two or three extra men for translating purposes. Due to the reduction in operating personnel in the Naval Service, it became imperative to devise means to operate stations with reduced personnel. Experiments conducted in 1922 prove conclusively that automatic printing equipment could be applied to radio as well as to land wire. So much faith was placed in this new method of transmission and reception that automatic recording telegraph equipment has been installed in naval high power circuits at San Diego and Washington.

They Backed Down

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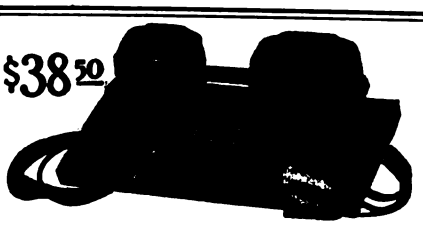

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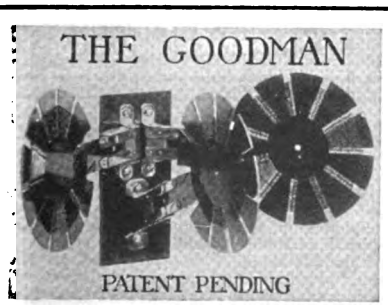

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Easy—Just Like That!

"Pap," said the colored youth, "Ah'd like you to expiate on de way dat de telegraph works."

"Dat's easy 'nuf, Rastus," said the old man. "Hit am like dis. Ef dere was a dawg big 'nuf so his head could be in Bosting an' his tail in New Yo'k, den ef you tromp on his tail in New Yo'k he'd bark in Bosting. Undestan', Rastus?"

"Yes, pap! But how am de wireless telegraph?"

For a moment the old man was stumped. Then he answered easily: "Jess prezactly de same, Rastus, wid de exception dat de dawg am 'maginary."—Tid-Bits.

A Voice from the Farm

(From Station WOC, Davenport, Iowa)

The broad, free prairies on which we dwell
Stretch far to meet the sky.
Few travelers come, the news to tell;
No restless throngs pass by.
We listen to wild blizzards roar,
While chill winds fiercely blow.
The wild beasts' tracks around our door
Tell stories in the snow.
But though we're isolated thus
From all the world around,
Through boundless space there comes to us
The miracle of sound.
Can lonely places be on earth,
Where human voice can't go;
Or intercourse have any dearth,
Since we've found Radio?
Across a listening continent,
Through weather hot or cold,
Great waves of harmony are sent,
And children's stories told.
Babes cradled where the frost elves sleep
And icy north winds blow,
Are lulled to slumber sweet and deep
By songs the palm trees know.
When God so wisely formed the ear
For His creatures here below,
He made the law which lets us hear
Through vast space, by Radio.
I thank, Thee, my Creator high,
That I have lived to know,
While life is fleetly passing by,
The wondrous radio.

Laboratory Lightning

A GOOD deal has happened in the electrical world since Benjamin Franklin drew down his first spark from a thundercloud over a kite-string wet with rain, says an editorial writer in the New York *World*. Out of this experiment grew the lightning-rod, now popularly discredited, and out of a century and a half of experiment has come a control over electrical forces so complete that a bolt of artificial lightning of 2,000,000 volts, representing 10,000,000 horse power, can be manufactured and handled in a laboratory. Incidently, this test proved to the satisfaction of the scientists present that the lightning-rod did give protection after all.

But what is to be done with artificial lightning, now that we have it, is no more predictable than what was to follow Franklin's kite-flying. It may bore tunnels, dredge rivers or change iron to steel. It may turn out as handy as a pick and shovel and quite as harmless. And when the race gets accustomed to lightning as an every-day tool it may find a way to capture the voltage that goes to waste in any thunder-storm, may charge batteries with the weapons of Jove and hitch the dreaded thunder-stone to the belt-wheel of a power mill. Perhaps in time there won't be any thunder-storms, and artists will decry the commercialism that extracts the juice from the sky that used to make celestial fireworks. If these things don't come about, in all likelihood something more remarkable will.

All the family can tune-in with

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Granddad, dad, mother and little brother all agree that "it is real joy to tune-in now with Accuratunes." A slight turn of the smaller knob operates the micrometer control for delicate tuning. Those stations you used to work so hard over, and others you could "just about get" are easily brought in clear and strong with Accuratunes. Knobs are of genuine Bakelite, either black or brown. Dial is silvered with neatly engraved graduations. $3.50 at your dealers' or by mail.

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These condensers have special bushings.

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BALDWIN SINGLE UNIT for Loud Speakers, Type C $3.75

American Radio Stores
235 Fulton Street New York City

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

PACIFIC COAST ELECTRICAL ASSOCIATION, San Francisco, Calif., June 19-22, 1923; S. H. Taylor, secretary, 527 Rialto Building, San Francisco, Calif.

CANADIAN ELECTRICAL ASSOCIATION, Montreal, Canada, June 21-23, 1923; Louis Kon, secretary, 65 McGill College Avenue, Montreal, Canada.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, annual convention, Swampscott, Mass., June 25-29; Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

Radio Set Presented to Veterans' Camp

Mrs. J. Christopher Marks, president of the Theatre Assembly, announced last week that the Assembly has just purchased an elaborate radio outfit for the Veterans' Mountain Camp at Tupper Lake, N. Y. The outfit, which is to be installed immediately, is a complete surprise to the residents of the camp who are confined there through illness.

Features of the Program at WGY

THISTLE DAY, the national holiday of Scotland, will be observed Sunday evening, June 24, with a special service at the State Street Presbyterian Church, Schenectady, N. Y. The entire program will be broadcast by WGY, the Schenectady station of the General Electric Company.

A minstrel performance will be presented by a group of artists from the Pittsfield, Mass., plant of the General Electric Company, Monday evening, June 25.

Tuesday evening the Albany Music Teachers' Association will offer a program of instrumental and vocal numbers. The orchestra will be directed by Mrs. Peter D. Schmidt.

Cyrus Temple Shrine Band of Albany, under the direction of W. Elmore Slack, will entertain from WGY, Thursday night, June 28.

The WGY Players will offer "It Pays to Advertise," a well-known play by Messrs. Megrue and Hackett, on the early program Friday night. At the late concert on the same evening, June 29, a trio of colored women will present a program of southern melodies.

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The Kelly Wave Sustaining Coil will work perfectly in any tube set. The coil being sealed under a vacuum, it eliminates STATIC and all interferences.

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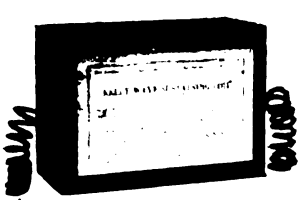

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WE REPAIR

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ALL BROADCASTING STATIONS—Complete with the call, location, wave length, frequency of the station, and power used started in Radio World of June 9.

This list is most complete, and no amateur or fan should be without it. It will be completed in following issues, and as revisions or changes are made the list will be kept up-to-date, so that you will always have an up-to-date list to which you can refer. Don't miss any issue. Send 15c to

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Old copies of RADIO WORLD for new copies. The publishers are short of the following numbers: April 22, May 20, June 24, October 21, December 2. Mail us these copies and we will send you a copy of a current issue, or extend your subscription one issue. RADIO WORLD, 1493 Broadway, New York.

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Then you will want these back numbers of Radio World: March 31, A Low Power CW Transmitter, by C. White. April 21, Haus Transmitter, by John Kent (circuit used by 2VK). May 5, Combined CW and Phone Set of M. Bebaut, at Radio Central. May 26, A Simple CW or Phone Set That Works. R. W. E. Decker, 2UA. These numbers describe in detail all the various parts, with complete instructions as to how to operate. No up to date amateur should be without them. 15c. a copy. The four copies for 60c. or start your subscription with any number.

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New Radio and Electric Firms

George J. Levy, wholesale distributor, has moved to 6 Murray Street, New York City.

Star Electric Contracting Co., New York City, $5,000; A. and B. Shulman, L. Seligson. (Attorneys, Littel & Seligson, 277 Broadway.)

Klein Radio & Electric Supply Co., New York City, $50,000; E. A. and F. G. Klein. (Attorney, L. A. Rosen, 261 Broadway.)

Kentucky Hydro-Electric Co., Wilmington, heat, light and power, $10,000,000. (Corporation Trust Co. of America.)

Smart Electrical Supply Co., Bronx, New York City, $10,000; B. Kessler, H. M. Schaap, L. S. Lewis. (Attorneys, Lewis & Schaap, 299 Broadway.)

Gillig Electrical Corp., New York City, general contractors, $10,000; J. V. Dicke, C. H. Walters, P. G. Gillig. (Attorney, H. A. Blumenthal, 233 Broadway.)

Westburgh Electric Service, Jamestown, N. Y., $15,000; T. J. Turner, A. E. Westburgh, A. Hanson. (Attorneys, Van Vlack & Bargar, Jamestown.)

New Amsterdam Electric Co., New York City, $20,000; S. E. Tepper, M. P. Plotkin. (Attorney, O. M. Lazrus, 38 Park Row.)

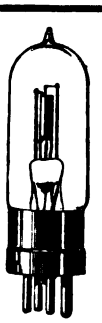
Pierce Electric Corp., Rochester, N. Y., contracting 1,000 shares common stock, no par value; active capital, $10,000; B. S. and A. Pierce, A. Preston. (Attorneys, Warren, Shuster & Case, Rochester.)

C. and W. Electrical Co., New York City, general contracting, $10,000; J. C. Cohn, S. Cohn, J. Moss. (Attorney, W. Klein, 152 West 42d Street.)

Hill, Brush Electric Service, Brooklyn, N. Y., $5,000; J. V. and R. and M. Tierney. (Attorney, J. E. O'Reilly, 391 Fulton Street.)

Triangle Electrical Supply Co., New York City, $18,000; D. Gold, I. Simon, M. J. Chester. (Attorney, B. M. Turkat, 44 Court Street, Brooklyn, N. Y.)

Robin Hood Radio Shop, Pittsburgh, Pa., has removed to larger quarters at 3602 Fifth Avenue.



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With one tube and a COAST COUPLER you can select at will any distant station. With each COUPLER we enclose our special Hook-Up, which we guarantee will surprisingly increase the efficiency of your set. This Coupler will be mailed anywhere in the United States upon receipt of **$5.00**

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The Rand McNally Radio Map of United States is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingemar, Ohio.

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ELEMENTS OF RADIO TELEPHONY, by Wm. C. Ballard, Jr. A standard book on radio telephony, the work of a recognized authority. Accurate, simple, clear, reliable and strictly up-to-date. For the technical man who wants to post himself on radio and for the radio enthusiast who wants the fundamental principles of radio and their application tersely and entertainingly presented. Price, postpaid, $1.50. The Columbia Print, 1493 Broadway, New York.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

SALE—Exide 120 hr. Battery, $12.50; Kellogg Sockets, 30c.; Transformers, $1.90. All kinds. Guaranteed apparatus at proportionate prices. KENNETH JONES, London Mills, Ill.

RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

CRAM'S RADIO BROADCASTING MAP of the UNITED STATES AND CANADA. Scale 100 miles to the inch. In two colors, size 34x28. Printed on high-grade map paper, up-to-the-minute information, indicating all amateur and standard broadcasting stations, with complete index to stations. 35c postpaid. The Columbia Print, 1493 Broadway, New York City.

TUBE RADIO SETS, $21.50 up. Parts sold at reasonable prices. Price list free. State whether interested in sets, part. McLean, 8103 Maryland Avenue, Cleveland, Ohio.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

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WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

ATTENTION! Is your set equipped with that new discovery, The Desert Cactus Cat Whisker? The Whisker that brings in the long distance. If not, order today—Set of two for 25 cents and get details on that new (Mars) long range crystal receiver—Address, Mars, Box 822, Needles, Calif.

Build your sets with quality parts and get sure results. Radio Parts Co., Box 56, Dunellen, N. J.

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FOR SALE—Radio Receiver, Navy type, cost $595. Good condition. Dealers invited to call and see. Also 8 genuine "Vario-perm" guaranteed .001 variable condensers. Columbia Print, 1493 Broadway, Room 326, New York City.

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RECHARGE dry cell batteries. Cost, 5c. Instructions, 15c. J. Brent, 3 Stueben St., Bridgeport, Conn.

FOR SALE—Unwired 3 stage radio 2 audio receiver. Write for information. Andrew Timberlake, Hinton, W. Va.

FOR SALE—Two Myers Choke Coils, 8 Myers tube receptacles, three Cot-o-Coil Radio Transformers, all for $15.00. F. T. Lesser, 85 Lincoln St., Ridgway, Pa.

BROADCASTING OUTFIT using five fifty watt tubes to be sacrificed. Everything complete. Make us an offer. Park City Radio Company, Bowling Green, Ky.

RADIO STORAGE BATTERIES, guaranteed, 50 amp. hr., $8.00. While they last. Write JAMES G. WILSON, Gen. Del., Box 34, Benson Station, Omaha, Nebr.

ELEMENTS OF RADIO TELEPHONY

By WILLIAM C. BALLARD, JR.

Assistant Professor of Electrical Engineering, Cornell University

This is a standard book on radio telephony, the work of a recognized authority.

It is accurate, simple, clear, reliable and strictly up to date.

The man with a technical background who wants to post himself on radio will find this exactly the book for his purpose.

The radio enthusiast will find in it an excellent presentation of fundamental principles and their application.

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Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

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Inter-American Communication Conference Proposed

AN official résumé of the activities of the Fifth International Conference of American States, held at Santiago, Chile, recently, cites the recommendaiton for an Inter-American Electrical Communication Commission and a communications conference as follows:

"Inter-American Electrical Communication: The first part of this resolution recommends to the American States, as an essential part of the public service, the supervision of international electrical communication and also domestic electrical communication insofar as it affects or forms part of the system of international communication. As a part of this resolution provision is made for establishment of an Inter-American Electrical Communications Commission sion to consider the cooperation which may be established between the American states regarding electrical communications, and to prepare a convention which shall establish equitable proportional rates and uniformity of rules governing Inter-American Electrical Communications; this commission to be called at a place and date to be determined by the Governing Board of the Pan American Union. The conclusions of this Commission shall be submitted to the Governing Board of the Pan American Union in order that they may in turn be submitted to the states belonging to the Pan American Union."

Hears by Radio, Though Deaf from Infancy

DEAF from infancy, William T. Walters, aged 31, a resident of Cohoes, N. Y., was recently introduced to the sensation of sound through WGY, the radio broadcasting station of the General Electric Company at Schenectady, N. Y.

Mr. Walters was stricken with brain fever when sixteen months old and specialists said he would never hear. After nearly thirty years of silence, he has heard a human voice and has listened to music.

A friend who is a radio enthusiast read of the pleasure which the partially deaf are deriving from broadcast programs. It occurred to him that Mr. Walters might be able to share in the music of the air. He arranged a test. In a letter to WGY that friend, Myron J. Jackson, describes the test:

"I adjusted the machine to a good clear tone and, after some explanation, put the receivers on the young man's head. He had not been listening more than half a minute when to our surprise and amazement he pointed to an imaginary mustache on his face, meaning a man. At this his mother exclaimed, 'Will can hear!' We waited motionless as Will listened to an address. At the end of the discourse his mother asked him if he had heard and using his right hand he drew a cross on his breast which meant 'honest.' I asked him what the man had been talking about and he pointed to a cigar and blew imaginary smoke from his mouth. The address had been on tobacco."

Another appreciative "listener" who has been deaf a great many years wrote from his home in Hyde Park, N. Y., as follows:

"No one who has not been afflicted with deafness to the extent I have for over thirty years, enough to shut me out from all concerts and lectures and the theatre, can understand the new world radio has opened for them. While some of the smaller stations are not powerful enough for me to hear clearly, the larger ones are, and WGY is best of all. Had I been in the First Methodist Church of Schenectady last Sunday I would not have heard a spoken word and mighty little music, while here in my room I heard everything well enough to follow the whole service, getting nearly every word of the sermon. If you want to confer a blessing on deaf people, let them know what radio will bring into their lives."

Branly, French Scientist, Says Radio Vision Is Possible

ACCORDING to a newspaper dispatch from Paris a wireless eye, capable of vision at great distances, is forecast by the famous French inventor, Edouard Branly, known as the "father of wireless," on the occasion of a scientific jubilee in his honor recently. Branly, who was honored by Government officials, Cabinet Ministers and radio fans throughout France, announced he had succeeded in transmitting by wireless a luminous point, as well as a luminous circle, proving the possibility of seeing by radio at hitherto unimagined distances.

Radio at the Shrine Convention in Washington, D. C.

RADIO, like practically every other activity, took part in entertaining the Shriners at the Nation's Capital last week. Among the features was the reception and amplification by a receiver in the Garden of Allah of a broadcast message from the President read by an aviator in a plane flying over the parade.

A local engineer installed a receiving set and a large loud speaker on the roof of the Albee Building. This apparatus amplified music and other matter picked up from nearby broadcasters.

Part of the Army's night parade exhibit was the miniature radio controlled cart made by the Dayton Air Station, which was operated from an auto some distance in the rear.

NAA put on special programs for local consumption and events scheduled for the convention were broadcast on opening day.

Many visitors were fooled by the loud speakers erected along Pennsylvania Avenue by the local telephone company for amplifying dance music played in an auditorium and relayed by wire to the many horns; it sounded something like radio but was actually wire telephonic transmission from local sources.

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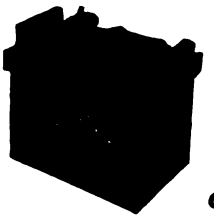

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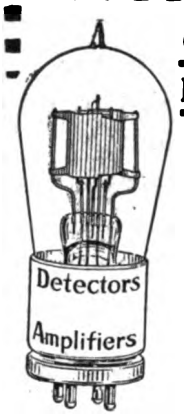

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Navy Favors Loop Antenna for Receiving

ONE of the good effects of the new broadcasting boom has been to bring to attention the great interference problems which exist, naval experts say. The loop antenna has been brought into great prominence for receiving purposes, as a means available for avoiding interference. Practically unlimited receiving ranges are possible with the loop when sufficient radio frequency amplification is used. One reads frequently of the enormous distances obtained on loops even as small as two feet in diameter. In solving Naval problems, it is very probable that the loop will be of service other than its use for direction finding. It is conceivable that all receiving may be done on loops sometime in the near future as is now done in Washington on the long circuits. Some of the advantages claimed for the loop are: sharp tuning; wide range of frequencies available in a single coil; one tuning adjustment; directive effect; easy portability and replacement; small space occupied, and little re-radiative effect when regeneration is used.

Radio Letters from Latvia

THE Latvian Main Post and Telegraph Administration announces that radio letters to the United States may be filed at all Latvian telegraph offices. The letters will be mailed to Berlin, whence they will be transmitted by wireless to New York, and from there to the addresses by post. The letters must contain text in English, French or German. The charges for radio letters are 35 centimes per word, plus 1 lat (equal to 1 French franc) ground fee per wire.

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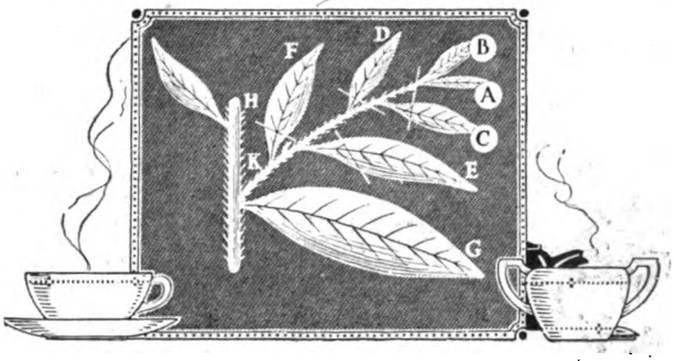
The A.B.C. of Good Tea



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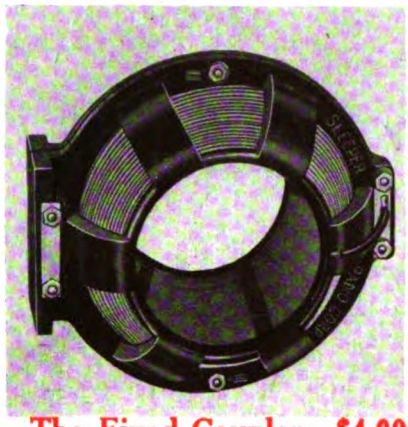

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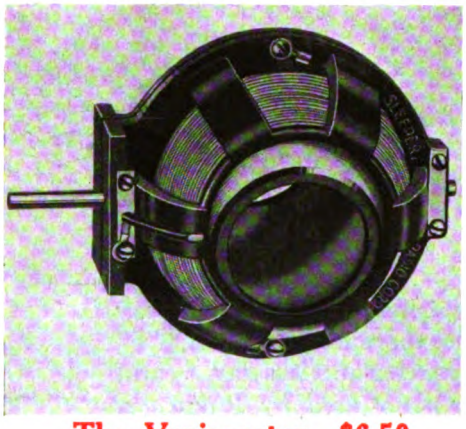

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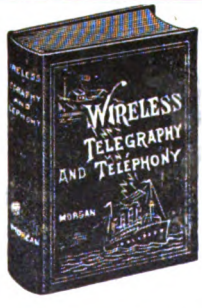

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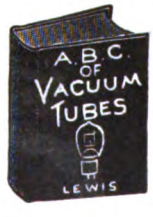

The A B C of Vacuum Tubes Used in Radio Reception

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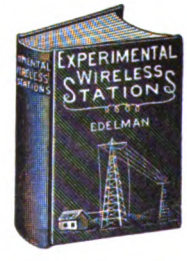
Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio telegraph signals and radio-telephone music and speech. Illustrated.....PRICE $1.00



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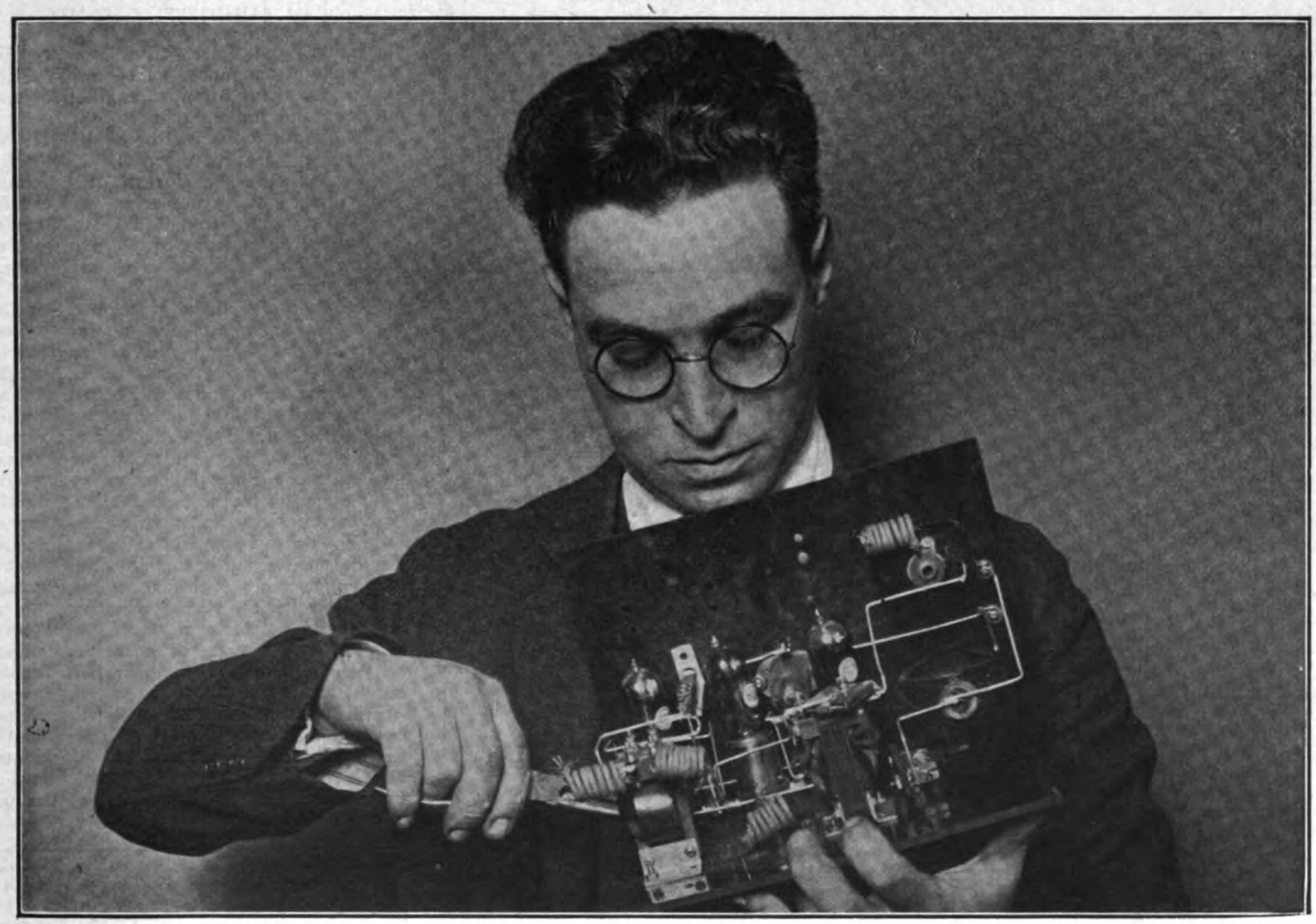

(C. Kadel & Herbert)

Bob Kalmus, of New York City, and the interesting set he has just constructed. It is light, compact, efficient, and has copied many DX stations. See description on page 18 of this issue.

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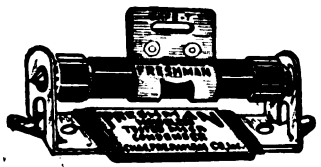

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Marconi Experiments With Directive Radio on New Wave

IMPORTANT developments are likely to result from experiments just completed by Senator Marconi and his staff, who arrived at Southampton, England, last week after a two months' cruise. Marconi said to a New York *Times* correspondent on his arrival:

"I have been working on a system of directive wireless telegraphy with highly satisfactory results. The new system effectively eliminates atmospheric disturbances. Wireless is still in its infancy."

Marconi has been developing his system of sending direct messages by wireless for many months. On his last cruise he has been experimenting on localization. Whereas wireless messages hitherto have been broadcast and could be picked up by other suitable instruments besides that of the recipient, with the new system it will be possible to send messages by wireless to one place only.

Senator Marconi, in a further interview on the results of his experimental cruise, said they constituted a great progressive step in wireless telegraphy.

"We have transmitted a message up to the distance of 2,500 miles not only with a very much smaller amount of power and energy, but also faster and more cheaply than with the ordinary system of long-distance wireless," he said.

"There is a great increase in efficiency and the cost is much reduced where this system is adopted. It will mean that a power station for long-distance work can be erected at much less cost. I have telegraphed on this system from the Cape Verde Islands, off the African coast, to Marconi House, and I wanted to try telegraphing from Brazil, but time prevented it.

"To send this message clearly and more rapidly over those 2,500 miles took less power than a message from London to Paris by ordinary methods. In fact, it was only a small fraction of the power required. It is done by the utilization of waves that have not been used before, and the production of them makes for efficiency."

During this cruise the yacht "Electra," on which the experiments were conducted, touched at Seville, Gibraltar, Teneriffe, Tangier, Capablanca and Madeira. Thence the yacht went to St. Vincent, Cape Verde Islands. Marconi purposes to go on another experimental trip in a few weeks' time and later to try his new system of long-distance wireless from off the coast of America.

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Civil Service Examination to Fill Junior Positions

THE United States Civil Service Commission announces an open competitive examination for junior engineer, junior physicist and junior technologist.

The examinations will be held throughout the country on September 5. They are to fill vacancies in the Bureau of Standards, Department of Commerce, at entrance salaries ranging from $1,200 to $1,500 a year, plus the increase of $20 a month, and vacancies in positions requiring similar qualifications.

Examinations will be given in the following optional subjects: For junior engineer, ceramic engineering, civil engineering, chemical engineering, electrical engineering, engineering of materials, mechanical engineering and radio engineering; for junior physicist, electricity, heat, mechanics, optics, physical metallurgy and radio; for junior technologist, general technology, leather technology, oil technology, paper technology, rubber technology and textile technology.

The work of the Bureau of Standards includes many branches of physics, chemistry and engineering, such as mechanics, heat, optics, electricity, sound, metrology, metallurgy, radio, electronics, etc., and offers valuable experience in these professions, combining, as it does, theoretical, experimental and practical work.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of U. S. Civil Service Examiners at the post office or custom house in any city.

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 14. Whole No. 66 **June 30, 1923** **15c. per copy, $6.00 a year**

"Leviathan" Has Duplex Radio Equipment of Great Power

By Charles Raymond

WHEN the reconditioned "Leviathan," the giant greyhound of the seven seas put out of Boston on a five-day trial trip it boasted the finest radio apparatus that graces any ship afloat. It is the first vessel to be equipped with radio apparatus that will allow simultaneous reception and transmission over a number of wave lengths.

This was accomplished after many months of experimentation by the engineers of the Radio Corporation of America, who equipped and will operate the station. In external appearances the transmitting apparatus greatly resembles the conventional radiophone apparatus used by broadcasting stations of the present date. But here the similarity ends.

By a special arrangement of channels and controls it will be possible for anyone on the ship to get into communication with any telephone receiving and transmitting station on land, and talk and listen with no more trouble than is experienced over a land wire. There will be no switching from listening to transmitting, or vice versa, and it is planned to establish a system of stations on land whereby the regular telephone lines can be used and by means of relays the people in the farthest reaches of the United States can be put into instant communication with anyone aboard the ship.

A special antennae system is installed, the major one of which is 600 feet long and over 200 feet above the water line. Other antennae are erected and can be switched to any of the apparatus used.

(C. Underwood & Underwood)

Powerful radio transmitters and receivers, allowing perfect duplex operation, installed on the S. S. "Leviathan."

Special tube transmitters of higher power than ever used on board ship before are installed, and communication can be carried on over a radius of approximately 4,000 miles by means of CW, ICW, and phone. The receiver is specially designed and is the most powerful yet made. It is said to have a consistant range of 6,000 miles.

This is the first time that any ship has had radio equipment of such tremendous power and scope.

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Pointers on Radio Trouble Diagnosis

By Kenneth Malcolm, A.I.R.E.

THE radio game is certainly discouraging to those who have had perpetual ill luck with their instruments. However, there is a cause for every little squeak and every click, and a careful search will bring all the troubles to the light where you can set about to remedy them. The following description of symptoms covers most of the ailments that are to be found in amateur receiving sets of the more conventional types.

First of all, a mention of the quality of apparatus will not be amiss; this factor cannot be emphasized too strongly. Whereas a set using a given circuit and high quality parts will give extremely fine results, a set using the identical circuit but with inferior parts may not work at all—so great is the difference. Just what constitutes quality in receiving apparatus? Well, let us look at the various instruments and see.

The coils of variometers, variocouplers and other such instruments should be wound on some rigid, non-hygroscopic form; that is, if a tube is used, it should be of impregnated cardboard, hard rubber, or one of the phenol condensation products, such as bakelite, formica or condensite. Wood parts should be thoroughly seasoned and impregnated to prevent absorption of moisture. All lead wires should invariably be soldered. The wire on coils should preferably be insulated with cotton or silk and uncolored.

All insulating parts should be of hard fibre, hard rubber, or one of the phenol products mentioned. Wood is not a good insulator unless perfectly dry and well seasoned. Metal parts should be of copper, brass, aluminum or some material that is non-magnetic.

Condensers are very important instruments and should be chosen carefully. Be sure that the plates are securely mounted and rigid enough to keep from bending, thus either short-circuiting or changing the capacity. Grid condensers, and other small fixed condensers, should preferably have a dielectric of mica. If paper is used, it should be so compressed and impregnated that it is impossible for the foil and the paper to change their relationship to each other. It is best to throw out a condenser whose capacity can be changed by squeezing.

The most common noise in a receiving set is a kind of clicking or grating that may sometimes be mistaken for static. This can be due to only one thing, the microphonic action set up by a loose connection, or an imperfect contact. Go over all your wiring and see that all connections are soldered. Look to your batteries and see that all wires are tight. Possibly a connection is defective on one of your instruments. If the concerts come in intermittently and go out the same way, without any apparent cause, the loose connection is an actuality. Take a peek at your aerial and make sure that it is not blown against some grounded conductor.

If signals come in fine on the detector tube, and not so good on the amplifier, inspect the jacks and the transformers. Many times the jack springs become weak and cause an imperfect connection. You can tell if there is an open circuit in the transformer by connecting it in series with a phone and a dry cell—one coil at a time. If you can get a click the coil is perfect. How are your B batteries? Are you employing the proper voltage for the tube you are using? With certain tubes it is just as much a sin to use too great a voltage as it is to use too little.

Squeals and howls are caused by a number of things, both natural and unnatural. If you are using a regenerative set, the tube would naturally squeal as it passes on either side of the incoming wave mark. If it squeals otherwise, your plate voltage is too high, your filament voltage too high, the regenerative coupling is too close, or else your grid condenser or grid leak is of improper value—possibly it is one of that squeezable changeable kind. Possibly your grid circuit leads run too near to the connections of the plate circuit. If you are using several stages of amplification it is possible that your transformers are too close together; shielding them, separating them, or tuning them at right angles to each other will help this.

If your set howls when you bring your hand near it or take it away, the best thing to do is to extend the shafts and move the instruments farther back in the cabinet, or shield the set with a metal plate fastened on the back of the panel; this latter should be connected to the ground post.

If your set works perfectly for local reception, but makes all kinds of noises when getting distant stations, your trouble is clearly defined. It simply means that you have to use too much regeneration in order to bring in the distant station. Regeneration can be carried only to a certain point; after that the waves become distorted and unintelligible. If it is necessary that you get the station in question perfectly, the regeneration must be cut down, and a stage or two of radio-frequency amplification added.

The tuning may be made sharper, especially in single circuit sets, by shortening the aerial to about say 80 feet, and adding a loading coil to make up the difference.

Those who are bothered excessively with static can move their aerial indoors to advantage, or a temporary aerial can be strung up around the picture molding. If you have a sensitive set, a loop aerial would make an excellent static eliminator; and would also give an added selectivity. Static can be reduced in sets having a loose coupler, or a variometer, by reducing the coupling. The static will be reduced greatly out of proportion to the reduction of signal intensity.

Coils may be tested for open circuits by the method mentioned for use with transformers. Condensers may be tested in the same manner, except that a click in the phone in this case would mean a short-circuited condenser, whereas no sound at all would indicate that it was perfect.

The tubes themselves are many times at fault, and the best thing to do is to test them on some other person's set. Shifting tubes will sometimes help. One particular amplifier tube might work better in the first stage than in the second stage; a detector tube might be better as an amplifier; and vice versa. Soft tubes make poor amplifiers, and all hard tubes cannot be successfully used as detectors.

How are your phone cords? Many times these become broken under the heavy outer insulation and pass detection. Test them, or try a new set of cords. Such a condition would prevent reception entirely or would produce the scratchy noises that have been attributed to loose connections.

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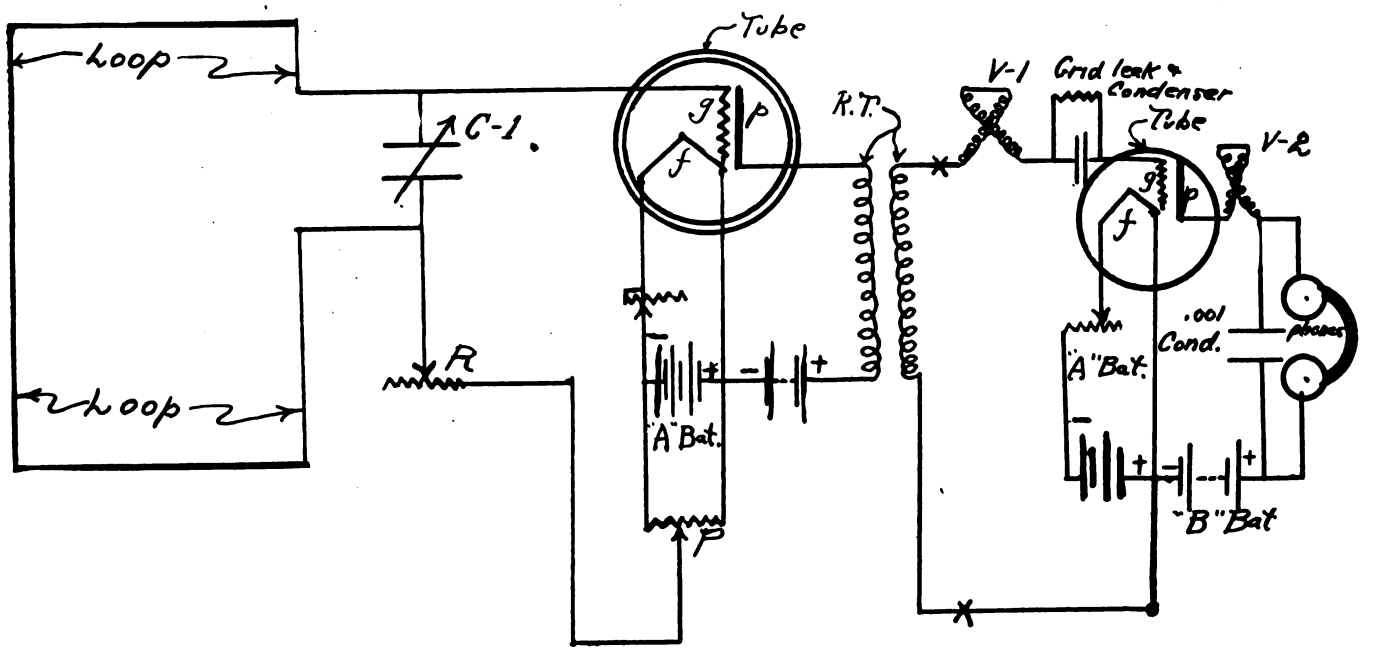
Radio-Frequency and Regeneration with a Loop Set

By C. White, Consulting Engineer

RADIO-FREQUENCY amplification and regeneration have always been considered an ideal combination but certain difficulties have always been present and rendered it next to impossible to accomplish commercially. One of the most potent troubles has been the inability to obtain stability; in other words one or all of the tubes in the circuit would start oscillating and it would be next to impossible to stop it. One solution has been to keep the source of power supply for each of the radio-frequency tubes and the other tubes separate. It is quite obvious that such an arrangement would not lend itself to portability or economy, since a separate set of "A" and "B" batteries would become necessary for the radio-frequency tubes, and the detector and audio-frequency amplifiers. The advent of the new UV199 tubes makes it readily possible to supply a separate "A" and "B" group for each tube or group of tubes without adding materially to weight or cost. By using the new tubes you can design and build this ultra efficient receiver and obtain results with a loop aerial that will rival in volume the best obtainable results from a good outside aerial, and the quality will be many times superior, especially since the loop collects only a very small amount of static because it is operated only a few feet from the ground and takes up so little space. The directional feature of the loop is very advantageous in cutting down interference from spark stations.

The loop not only acts as a collector of the signal energy but also acts as a part of the main tuning element. No effort should be spared to construct the loop with great care. The wire should be stranded or plaited copper ribbon and the loop wire or the lead in wires from the loop should not be allowed to rest on anything except some reliable insulating material. The loop should measure about three feet per side and should have ten turns in all. In order to provide a means of tuning the filament-grid circuit of the first tube the condenser C-1, in the sketch herewith, is employed. C-1 is an air variable having 23 plates in all and a reliable form of vernier control. The cabinet holding the set should be partitioned off at the points marked x x on the diagram. This partition should be coated with copper foil in the same manner as the walls of the cabinet and panel. You may be able to get away with very little shielding with an ordinary regenerative receiver but when radio-frequency is used with regeneration shielding must be carefully carried out in order to prevent interstage coupling.



Schematic diagram depicting how a single stage of radio-frequency can be combined with a regenerative set to operate on a loop. Full directions are given in the accompanying description for the construction of this set.

Every possible precaution is taken against oscillation on the part of the radio-frequency tube. The first provision is the employment of the potentiometer P whose resistance should be around 400 ohms. The resistance R is another such precaution. The resistance R should be of the 400 ohm type, but in order to keep down noise during adjustment it is better to get a resistance of the smooth varying type such as the carbon pile potentiometers.

The radio market for reliable radio-frequency transformers has certainly improved within the last six months. It is now easy to purchase good radio-frequency transformers and you should take care to see that you get one of the better types that are now available. The connection of this transformer is indicated by the letters R.T. on the schematic diagram. The variometers V-1 and V-2 are ordinary standard variometers for short wave work. Finer tuning adjustment and the amount of regeneration is fully controlled through these two variometers. Owing to the fact that radio-frequency amplification is added to the benefits of smooth regeneration it is little wonder

(*Continued on next page*)

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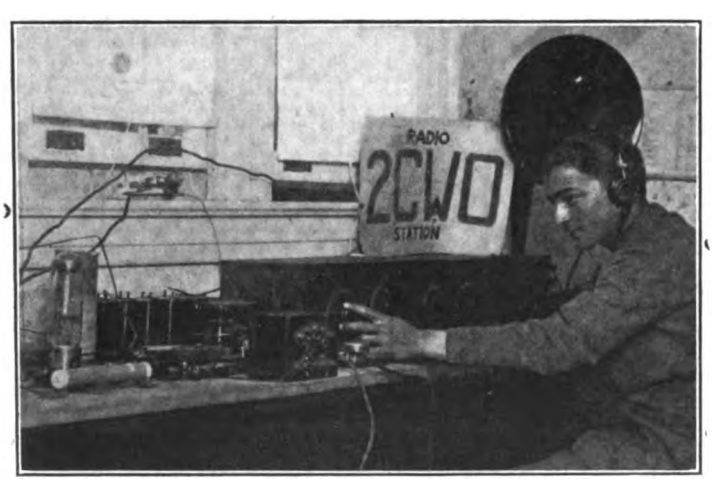
Scrambling the Conversation Insures Radio Telephone Privacy

THE radio telephone link between Los Angeles and Catalina Island, 30 miles off the coast of California, has set a new record in the history of communication. It is the scene of the first trial on a commercial basis of a radio telephone system insuring privacy to its users. The radio telephone apparatus which has heretofore established connection with the mainland is now replaced by a new radio development of the Bell System engineers which may be called a privacy system for the radio telephone. The new apparatus prevents any of the receiving sets commonly in use picking up the messages transmitted by this system and converting them into understandable speech.

The wireless "talk bridge" which has given telephone service across the 30 mile gap of water separating Catalina from the California coast is unique in many respects. It was designed and installed in 1920 to give two-way talk between the mainland and an island 30 miles at sea, and has proved in on a commercial basis, giving satisfactory transmission day and night throughout the year.

Now again the Catalina Island radio link is distinguished as the first to be equipped with the wireless telephone privacy system recently developed by the engineers of the Bell System.



(C. Photonews, N. Y.)

Edward C. Tassi, a Brooklyn, N. Y., amateur and his radio station. He uses a single 50-watt tube transmitter employing the Hartley circuit, and has been heard great distances.

Heretofore talks over the Catalina Island link while clear and understandable to those using the service, have also been picked up by amateur radio receiving stations in the neighborhood, so that the privacy of the usual telephone conversation was lacking. Any radio receiving station in that part of the country, if it happened to be tuned to the right wave length, might get fragments of the talk with Catalina Island, which would be of no interest to the radio listener. Of course, the talket could not tell how far afield his words might accidentally go.

The privacy system was designed by the American Telephone and Telegraph Company to largely remedy this situation. It is not claimed that the new system is absolutely secret, but at least privacy has been obtained, so that no one will inadvertently overhear the conversations which are transmitted by this system.

The new radio equipment which has been installed both on the Island and the mainland will handle telephone messages in such a way that they will be unintelligible to all ordinary radio receivers. In a word, the new sets, before putting the messages "on the air" will distort or scramble them, and no receiving set which is not specially designed or manipulated to unscramble them can obtain anything intelligible.

While anyone familiar with this system, and possibly an ingenious person not familiar with it, might devise a set which could listen to the system, such a set would be much more complicated than the ordinary set, and the added complication would be of no value except for picking up transmission over this system. It is, therefore, not likely that many people will undertake this work.

Such a privacy system may be compared to a lock and key. A person relies upon a lock to secure his house and other property and is not much troubled by the possibility of a thief breaking in to steal. However, this is always a possibility. The privacy system presents an analogous case. For all practical cases it insures the requisite privacy to a radio telephone conversation but it does not make impossible the designing of a special set, near enough like the receiving sets used in the system itself, to transform the messages into more or less intelligible form.

(Concluded from preceding page)

that such good results are so easily obtainable. But you will have to be more particular with your little constructional details. All connecting wires should be kept as short as possible and at the same time they should be well insulated. Do not allow two different wires to rest against the copper foil shielding. If this is done serious capacity leakage will occur if the wires happen to be at a difference of radio-frequency potential.

While this outfit is not so compact as some other types of summer receivers still I think that for reliability of results it is worth the increased bulk. Of course, if you prefer loud speaker operation one or two stages of audio-frequency amplification ought to be employed. If this is done it will not be absolutely necessary to use a separate set of "A" and "B" batteries for the amplifier, since the same "A" and "B" of the detector will amply serve. But it will be advisable to use a separate small flashlight type of "A" battery for each tube. Of course, if the No. 6 type of dry cell is used for the detector "A" it will be large enough to supply filament current to the amplifier tubes as well. For average usage 45 volts on the plate of the radio-frequency tube, about 22 volts on the detector and 45 on the audio-frequency tubes, if audio-frequency is employed, will be about the right "B" potentials. To enhance portability the small style of "B" batteries can be used. The set could have been designed to use choke coils and telephone size condensers, but it is cheaper and more reliable to employ separate "A" and "B" batteries. The UV199 tubes, as I have said before, are the ideal tubes for this set because they draw little current for filament use and an ordinary set of two flashlight cells is enough to supply current for quite an extended period.

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"Radio Movies Are Here"—Jenkins

By Washington R. Service

THE near future will see the perfection of radio movies; essentially, they are here to-day. Every "listener-in," with the aid of a special apparatus, contained in a box about a foot square, and a small curtain, will be able to see as well as hear over the versatile radio, according to C. Francis Jenkins of Washington, D. C.

Last week Professor Jenkins, who has previously demonstrated the transmission of still pictures by radio, showed on a screen in his laboratory the movements of his hand and other objects held in front of his radio transmitting apparatus in another room. The apparatus used in transmitting still pictures was employed in the last experiment, but a new "lens-faced prismatic ring" was introduced to show a rapid succession of pictures depicting movement.

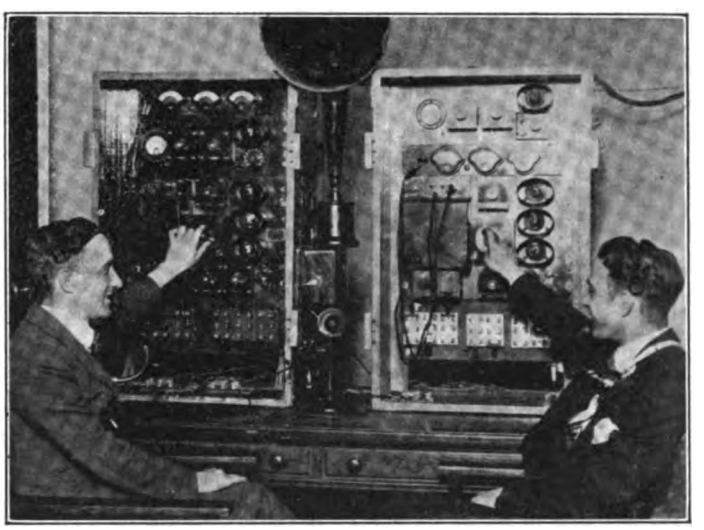
Perfection of the moving picture radio transmitting set now awaits only the manufacture of a new and more powerful electric lamp of the "corona-glow" type. In the recent demonstration a temporary lamp was made by the inventor but it is not strong enough to transmit large pictures. The question of rapidity is solved, Professor Jenkins says, as he has already sent pictures at twice the standard movie speed. What he needs is a better and stronger lamp which will stand up when the signal strength is increased about 3,000 times, as is necessary in sending pictures in motion.

Not only actual pictures of moving bodies can be transmitted, by pointing the machine at them, but films can be broadcast, he claims, as shown on screens in theatres or homes where proper receiving and reproducing apparatus and a screen are available. When the power of the light is raised the size of the picture can be increased, it was explained.

Radio experts of the Navy, who saw the first demonstration between two rooms of Professor Jenkins' laboratory on Connecticut Avenue, say that the invention is adaptable in military operations as well as in commercial fields. They point out that a transmitter used in an airplane over the enemy fleet or trenches, would give officers far in the rear an actual view of the fall of shells and all front-line activities. In the commercial field, with some adaptations, moving picture distributors might transmit their films to subscribers via radio instead of by express, saving time and the making of many copies.

With the completion of his new lamp, probably not sooner than several weeks, Professor Jenkins promises to give a long-distance demonstration, transmitting pictures of objects in motion and perhaps films, between Washington and probably Philadelphia.

Four Large Broadcasters Operate Simultaneously



(C. Photonews, N. Y.)

For the first time in history four radio stations broadcast the same program, although separated by many miles. The annual convention of the National Electric Light Association at Carnegie Hall, New York City, was broadcast through Stations WEAF, KDKA, KYW and WGY, first relaying the speech over land lines by means of the double set of speech amplifiers shown here.

Radio Frequency Indicator for Broadcasting

AT the recent Second National Radio Conference held in Washington, it was resolved:

"That every broadcasting station should be equipped with apparatus such as a tuned circuit coupled to the antenna and containing an indicating instrument or the equivalent for the purpose of maintaining the operating wave frequency within two kilocycles of the assigned wave frequency."

The Bureau of Standards has designed a preliminary model of a radio frequency indicator to meet the above need and has prepared specifications covering its construction. These specifications may be had by any broadcasting station upon request.

The instrument consists essentially of a 72-turn space-wound coil on a 3¾-inch tube, an air condenser, and a sensitive thermo-galvanometer. These three elements are connected in series. The condenser, which is of the variable type, is provided with a locking device so that it may be locked and soldered into position after the instrument has been adjusted to indicate the required frequency. This instrument may be set to indicate any radio-frequency in the range from 1350 kilocycles (222 meters) to 550 kilocycles (545 meters).

If any instrument is constructed according to the specifications and sent to the Bureau of Standards Radio Laboratory, by a licensed broadcasting station, it will be adjusted for a nominal fee to operate at the frequency of the station.

Who Is Your Favorite Radio Entertainer?

THE editor of RADIO WORLD is interested in finding out just what kind of entertainment and just which entertainers are most appreciated by listeners throughout the country.

We should be glad to have you, as a RADIO WORLD reader, write us and let us know, in a short letter running from twenty-five to fifty words, the kind of entertainment you like best and the name of the man or woman who has most appealed to you as a radio entertainer.

Address Editor, RADIO WORLD, 1493 Broadway, New York City.

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Hints and Tips for the Radiofan

Shop Kinks, Short Cuts and Easy Rules of Thumb for Amateurs

UNDER this heading RADIO WORLD will publish from time to time helpful hints that the average fan is not aware of and that will help him to get the most out of the construction and operation of his set. Such things as shop hints and little warnings of what not to do and what to do in the use and care of a set will be told in such a manner as to be of real practical value.

Phones—How To Take Care of Them and Use Them Properly.

By C. E. Brigham,

Radio Engineer, C. Brandes, Inc., New York City

Telephone receiver apparatus is one of the most delicate of the sensitive instruments used in or around a radio set. Therefore, a certain extra amount of care should be taken of them if they are to render the exacting service that they should and do it in the proper manner.

(C. Underwood & Underwood)

A summer's day at Rye Beach, N. Y. First a sea bath and then a rest in the canoe while the radio concert comes in. Almost ideal, what?

The average amateur would do well to memorize a few good rules that will prolong the life of the phones and help them to give him perfect service. Some of these are:

1. Don't try to find out what is inside of your receivers. By doing so you spoil the tone quality by disturbing the setting and also destroy the perfect tone matching of the two receivers.

2. Don's drop your receivers from a height of greater than three feet. To do so you will cause the magnets to lose their magnetism and render the phones useless. It has been proven that a good phone should stand a jar occasioned by a drop of three feet without any great harm. But don't try it just to prove it—take it for granted and take care.

3. Don't connect up your telephone receivers at random. There is a correct manner in which receivers should be connected when used with a set. This is especially true of a vacuum tube receiver. Make sure of the polarity of your cords when hooking up your phones in a plug. Trace your connections.

4. Don't blame the headset for every trouble which occurs. Check up the rest of your set.

5. Receivers should not be re-magnetized unless the proper equipment for doing so is at hand. You cannot do this by connecting them across a 110 volt current. If you do so you will burn out the wires which are finer than a human hair.

6. A headset should not be judged by its direct current resistance, but by its alternating current opposition which is known as its "impedance."

7. It is a good plan to have a convenient hook to hang your receivers on. This prevents any chance of them being dragged or pushed off the table onto the floor, and makes a much neater appearance.

8. If you think your receivers are losing sensitivity send them to the manufacturer and he will fix them. Don't attempt it yourself—it is the work of an expert.

9. Always keep your phone cord dry. Do not let acid come in contact with them.

10. An ordinary receiver is not a loud speaking phone and should not be used as such. Loud speakers are specially made to stand heavy currents and it is poor policy to use regular head phones in conjunction with a power amplifier.

11. Phones are poor battery testers and batteries are poor for phone testers. Do not use head phones where there is current flowing. The current normally flowing in the plate and phone circuit is of minute quality and the fact that you are using 22½ or 45 volts in the circuit does not mean that phones will stand that direct current through them. They will not.

12. The correct manner to connect up numerous pairs of phones is known by few people. If you are using

A—2 pair—they should be connected in series.

B—3 pair—they should be connected in series.

C—4 pair—they should be connected in series—parallel groups of two each. Two in series and the lot in parallel.

D—6 pair—they should be connected in series-parallel—three groups of two each. Two in series and the three groups in parallel.

Shop Kinks for the Amateur Worker

When turning down or dressing a rough casting and it is not desired to use your good tools, try using an old file sharpened to a flat or sharp edge as needed by the class of work.

Bakelite will sometimes swell when worked fast. Tools used for drilling or cutting bakelite should not be forced or their temper will be lost. You may be in a particular hurry to drill a piece of bakelite, but you will lose a good drill, or saw if you force it. Take it easy, and stop when it shows signs of heating.

Good work cannot be accomplished with dull tools. It only takes a minute to keep them sharp with the aid of an oil stone, or emery wheel, and you can do much neater work.

If your drills go dull on you don't try to sharpen them unless you understand how. A good drill has a certain angle for each type of work, and if you don't understand it, you run a chance of spoiling your drill and the work also. Take it to some one in the shop who knows.

A handy marker for use when drilling and sawing a polished panel can be made from an old nail punch sharpened to a point.

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Pitfalls of the Radio Investigator and Inventor

By Everett N. Curtis

(*Concluded from last week's* RADIO WORLD)

[*Everett N. Curtis, the author of this article, is the lecturer on patent and trade-mark law at Columbia University and is a patent solicitor in active practice in New York City. He is the author of Curtis' "Manual of the Sherman Law" and a number of monographs. He was graduated from the Massachusetts Institute of Technology in* 1898 *and from the Boston University Law School in* 1900.—*Editor,* RADIO WORLD.]

ANOTHER matter to be considered by the inventor is the importance of preserving the dates of his invention. If he obtains a patent and thereafter brings a suit, it may be advisable to show that he conceived his invention and reduced to practice before the person who is claimed to be a prior inventor, or prior user, or author of a prior publication. Such proof may also be important should he be thrown into interference in the Patent Office during the prosecution of his application. No inventor's mere say so, uncorroborated by other evidence, will be sufficient to establish the date of invention. There must be evidence of disclosure to others, drawings or writings, or the embodiment of the invention in some perceptible form. Memorandum books with dated and witnessed sketches and descriptions are often used to prove the date of conception. All inventors should have such books or memorandum sheet, and should carefully preserve the same. As soon as the creative thought occurs to the inventor, he should record the same in his memorandum book, and if possible should fully illustrate the same with sketches. When he has done this, he should have the same witnessed and signed by one or more witnesses. Letters written to some member of the inventor's family or to a friend, making the same disclosure, are also good evidence, particularly where the envelope showing the cancellation date of the Post Office is preserved. Probably the best evidence outside of a reduction to practice is an affidavit with attached sketches before a notary public, with his seal attached. But even the establishment of the first date of invention may come to naught unless the inventor is shown thereafter to be diligent in reducing his invention to practice. The inventor should, therefore, be prompt in trying out his invention in some practicable form; his work must be promptly finished physically as well as mentally. If he waits too long between conception and reduction to practice some other inventor who may independently conceive the invention subsequent to his date of invention but who first reduces to practice may be held to be entitled to the patent because of the want of diligence of the earlier inventor. Reduction to practice may be accomplished in two ways. *First*, by carrying out a process on a commercial or practicable scale, by constructing and operating a practicable machine, or by producing an article of manufacture, or composition of matter, or *Second*, by filing an application for patent, which operates as a constructive reduction to practice. In any event the inventor, should take care, in so far as possible to make his disclosures to persons of intelligence, since otherwise he may jeopardize his rights if he depends upon evidence of witnesses who do not rightly comprehend the invention or its purposes, and cannot therefore clearly testify as to what the disclosure really was. Memoranda, sketches, and letters if once established speak for themselves, it is true, but corroborating witnesses if not intelligent may make difficult even the establishment of such written evidence.

Another matter sometimes overlooked by the inventor is the necessity of making a full disclosure in his application for patent. If the patent attorney who draws the application has not all of the facts as the inventor knows them, such inventor should not complain if he finds his invention is not fully covered and protected. If possible, the inventor should supply his attorney with the fullest possible written description of his invention, together with working or intelligible drawings. If the inventor must supply his description verbally, let it be very full and complete. Furthermore, the inventor should insist that he be permitted to take home and consider the specification and claims after the same have been prepared by this attorney, and after he receives such specification he should read the same with the utmost care to be sure nothing has been left out. After the application has once been filed, while the full opportunity is otherwise afforded for amendment, the Examiner will not permit *new matter* to be added. The inventor should also study the claims, which are the measure of the patent, and carefully bear in mind that everything which is not claimed is dedicated to the public. He should also consider that the more carefully prepared the specification and claims of the application, the more valuable will be the patent when issued. If he hurries his patent attorney, or in his anxiety to get a patent at the least possible expense, employs inferior talent, he must not be surprised if his patent when issued is of such narrow scope as to be of little or no value. If, therefore, the inventor finds himself in a position where by reason of lack of means, he is unable to employ a solicitor of standing and experience, he should endeavor to seek out and interest some person with capital in his invention. It is better by far to have a half interest in a valuable patent with broad claims than the whole interest in a patent with claims so narrowed that they are limited to the precise device shown and can be easily avoided without penalty.

The inventor should also consider the two years statutory bars of the statute, and take care not to use his invention commercially or publicly for two years before applying for a patent. A public publication or use two years prior to an application completely bars an inventor to the right to a patent. If therefore any person, including the inventor, has de-

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scribed such invention in a printed publication or has used the invention for more than the two years prior to his application the inventor forfeits his rights unless he can show such public use was entirely his own and was experimental in character. An example of such experimental use is that of an invention for a city pavement, where it might be necessary in order to test the same experimentally, to employ more than the two years public use. Courts, however, are prone to look askance at the suggestion of experimental use in reply to the defense of public use, so that it is wise to avoid experimental use by the inventor if possible.

Where an employee invents, even though the invention is made during hours of employment, and the employer pays for the prosecution of the application, all that the employer will obtain in the absence of any express agreement is a shop right or at the most an implied license. The right to the patent still remains in the employee. Where there is an express agreement that the employee will assign to his employer all his inventions relating to the employer's business during the period of his employment, the courts will enforce such agreement and compel the inventor to assign. Agreements, however, of this character are strictly construed, and unless the word assign or the equivalent is used, the tendency of the courts is to give the employer only a shop right in the invention. If the agreement were not restricted to a particular class of inventions, or to the business of the employer, and required the inventor to assign to his employer all his inventions of any nature whatsoever, the court would hold such an agreement to be in restraint of trade and would refuse to enforce it.

The patent law requires all assignments of patents as against a subsequent purchaser or mortgagee for a valuable consideration without notice, to be recorded at the Patent Office within three months from the date of the assignment or prior to such subsequent purchase or mortgage. Except, however, as against such purchaser or mortgagee, recording is not necessary to the validity of the assignment or chain of title. This clause is not very important as to the inventor, except as he may desire to protect the interests of assignees, or except perhaps as he himself may acquire patent interests. Any person purchasing a patent should cause a search of the title to be made at the Patent Office at Washington in order to make sure that such title is clear, and should in general take the same precautions as if he were taking title to a parcel of real estate.

By joint inventors is meant those inventors who together create a single invention. They are entitled to a joint patent, but neither of them can obtain a separate patent for the invention. If they desire they may file separate or joint applications, but only one patent will issue. The fact that one person furnishes the capital and another makes the invention does not entitle them to make an application as joint inventors, but in such case they may become joint patentees upon the inventor assigning an undivided interest to his colleague. Independent inventors of distinct and independent improvements on the same machine cannot obtain a joint patent for their separate inventions. In such case a separate application should be filed for each inventor. Since it is but rarely it can affirmatively be shown that two or more persons have joined in the creation of the invention, very few applications for a joint invention are filed. Great care should be exercised by the inventor where he supposes he is a joint inventor. In many cases it will be found after carefully sifting the facts there is in reality but one inventor, and if such inventor is so careless as to permit another person to be joined with him as joint inventor, the results may be very serious in case of litigation. After the patent for a joint invention has been issued, if it develops that the invention is not in fact joint, the patent will be declared to be void.

In some instances it may be determined that particularly where a process is concerned that such process will be held secret. In case the inventor determines upon such course, he should carefully bear in mind that once he has determined to keep his invention secret, while availing himself of the results commercially, he may if such secret use is long continued, lose his rights to a patent. In some cases the inventor after using his secret process for a number of years has become alarmed lest such process through the unfaithfulness of an employee might be divulged to the public and has made application for and has received a patent for such process. Where such facts, however, have appeared to the court, it has been held, in the case of a concealment for the purpose of profit over a long period of years, the patent will be held to be void because of constructive abandonment or forfeiture of the right of an inventor to a patent.

So far as concerns foreign countries, the inventor should bear in mind that once the invention is divulged to the public, either in the form of a patent or other printed publication, such publication will become a bar to the issuance of a patent. This applies particularly to foreign countries, there being an exception relative to U. S. patents in the case of the inventor himself who is not debarred from receiving a patent for his invention in this country by reason of its having been first patented by him abroad, unless the application for the said patent was filed more than twelve months prior to the filing of the application in this country. The proper course to pursue in the ordinary case is after notice of allowance is received by the inventor in this country, to utilize the six months in which he is to pay his final fee for the filing of such applications in foreign countries as he may desire. In this country a patent does not go to issue, that is become published, until the final fee has been paid, and since the inventor has six months for such payment he has ample time before paying such fee to file his applications abroad.

Another important matter to be considered is that of constructive abandonment of an invention. This occurs where the inventor by reason of indifference or otherwise permits others to use his invention without objection over a substantial period. Where the invention has been thus abandoned the right of a patent is gone on the theory that where a gift is once made to the public it can never be taken back. Sometimes where an inventor has ceased experimenting upon a particular device which has proved defective for the purposes for which it was designed, such situation gives rise to the presumption of an abandoned experiment. Once the inventor has exercised his creative faculty and has conceived an invention it is accordingly incumbent upon him to proceed diligently in perfecting his invention and applying for a patent, since otherwise, his lack of diligence or slothfulness may be construed as an abandonment, in which case his right to a patent is entirely gone.

Such are the main pitfalls to be encountered by the ordinary inventor in this country, most of which may be avoided through the use of ordinary care on the part of the inventor. At all times the inventor should bear in mind the maxim of the equity courts, in which most patent cases for infringement are tried, which is that equity aids the vigilant, not those who slumber upon their rights.

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RADIO PRIMER

For the New Army of Radio Beginners

By Lynn Brooks

AUDIO-FREQUENCY AMPLIFICATION: In a receiving circuit consisting of the regulation tuning circuit and rectifier or detector, no more current can be made to flow through the phone circuit than is originally found in the circuit itself. Self amplification is possible through regeneraton as previously stated, but even this method has its limits. To make the received signals louder means have to be employed to step up the current and for this purpose amplifying circuits are employed.

A properly designed audio-frequency amplifying circuit bears a great resemblance to a tuned detector circuit as can be noted by comparing the two. The main difference in the two is that a transformer is used and there is no condenser in the grid circuit, as the signals are of audio-frequency (15,000 cycles or lower) and they are pulsating direct current and do not have to be rectified. The amplifying transformers used bear a great resemblance to the ordinary step-up transformers used in low frequency work. An iron or steel core is wound with a great number of turns of very fine wire. Over this is wound another coil of wire, generally of a smaller size wire, and with 3½ to 10 times the amount of wire of the first coil. Upon the ratio of one winding to another depends the ratio of the transformer.

This transformer is inserted in the place of the phones, the primary or smaller winding taking the place of the phone windings. The secondary is connected in the grid circuit of the second tube. When a current is flowing in the detector circuit an induced current is caused to flow in the secondary winding. As this winding is connected in the grid circuit, any current flowing in it will be correspondingly heard in the phone circuit of the second or amplifying tube. This current, due to the fact that the transformer steps up the minute currents allows a very weak current in the first tube to be heard, with a corresponding increase in strength in the second tube.

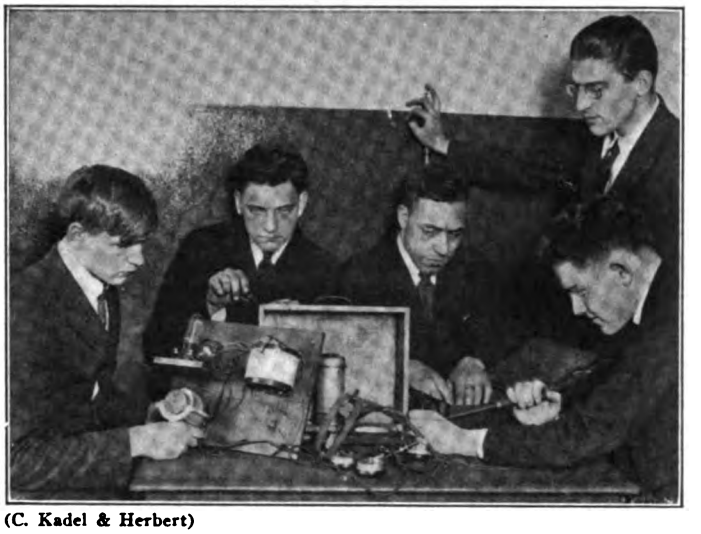
It is to be understood however that audio-frequency amplification will not allow the amplification of signals which cannot be heard with the detector alone.

When handling audio-frequency amplification circuits, certain precautions must be observed. Due to the fact that there is an electromagnetic field of considerable strength generated around a transformer, it is necessary to see that the transformer is not placed in such a manner that the field will interfere with the other parts of the circuit. Should this occur, howling and inter-tube noises will be generated and the circuit will not give the good results that are desired of it. It should also be borne in mind that if more than one stage of amplification is used the transformers should not be placed too close together, and they should be so placed that their magnetic fields will not interfere with one another. It is always a good plan to place the transformers at right angles to one another. Occasionally it is of value to surround the transformers with a metallic shield, and then ground the shield. This effectively prevents interstage coupling, or noises due to the magnetic field of one tube setting up induced currents in its neighbor.

When using more than one stage of audio-frequency amplification it is generally the best practice to use a lower ratio transformer in the second step than in the first. This of course varies with the tube used, and as each type of tube has its own internal characteristics, the manufacturer generally specifies a certain ratio transformer, when used as a first or second stage.

When more than two stages of amplification are desired it is best to use what is known as the push-pull transformers, with two tubes in parallel. If more than two stages of straight amplification are used the signals will be distorted, whereas if the power amplification idea is used the signals will not be distorted due to the fact that the current is evenly divided beween two tubes and they are not overloaded.

Blind Boys Build Radio Sets



(C. Kadel & Herbert)

Making radio sets that will function efficiently is a hard task for one possessed of all his senses. But when one is blind, it is an extra hard task. Olaf Larson, Stanley Wartenberg, Christopher Cerone and George Keene, four boys from the New York Institution for the Blind, are here shown constructing a tube set under the instruction of Arthur Richmond.

A Warning About Radio Stocks

IT is natural that a field so prolific and progressive as that of radio, should attract the stock vultures who already have started out to corral the dollars of the unwary investor.

There are several good radio stocks that are worth buying.

Many of those offered are not worth even as much as a German mark.

Altheugh the Hennessy Radio Publications Corporation has a limited amount of stock of its own to sell, this is not written for the purpose of inducing any of our readers to buy a single share of it. It is written, however, in an effort to save the hard-earned dollar of our readers in cases where an investment would in all probability lead to total loss.

If you intend buying radio stocks of any kind, tell us just what is in your mind. We will make an investigation at our own expense and let you know the results. You will find that we will praise the right kind of stock investment just as honestly as we will tell you the truth about some of the wildcat radio stocks now being offered.

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The Old Reliable Variometer Hook-Up

By C. C. Hermann, M.E.

I HAVE heard a good deal of complaint against the variometer hook-up, in fact so much that I decided to build a set and find out for myself whether or not such complaints are justifiable. I have had this hook-up in operation about a year and with a summer's and winter's experience in the background I believe I can safely recommend it to those desiring a variometer receiving set. Before presenting the hook-up and a description let us analyze some of the more common complaints.

Complaint number one: Difficulty of tuning due to body capacity. This trouble is experienced with variometers and can be overcome by any one of three methods of construction as follows:

1. By shielding the set. Shielding consists of a thin copper sheet attached to the back of the panel. Sheet copper of 30 gage will be just the thing. Approximately the same results can be obtained by the use of tin foil glued to the back of the panel. The shielding material must be cut away around all instruments and binding

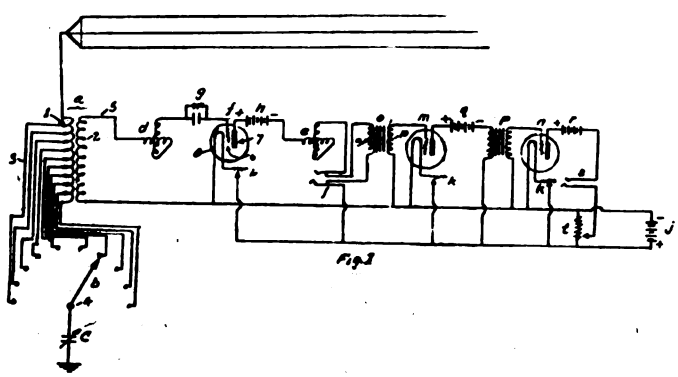

Fig. 1. Schematic hook-up of three unit regenerative set with two steps of audio-frequency amplification.

posts in order to maintain insulation between all parts of the set. The shielding material is, however, grounded to the ground binding post. Shields may also be placed between the instruments and are an assistance in tuning-in.

2. By locating the variometers a distance back from the panel. The variometers may set several inches back from the panel and a shaft extension of non-conducting material such as bakelite or hard rubber used to attach the dial.

3. By proper manipulation of the tube rheostats. If the tube filament current is turned down while tuning and when a signal is obtained then turned up to increase the volume, body capacity will be minimized.

Complaint number two: Inability to tune closely. This is due to improperly constructed instruments. The variometer, to tune closely, must be constructed with a minimum amount of clearance between the windings. It is almost impossible to obtain efficient operation with a home built variometer unless the builder is equipped with the necessary tools and has the ability to form the windings. The outer winding should be placed on the inside of the outer shell and as close as it is possible to get it without actually touching the inner winding, which is wound on the rotor.

Complaint number three: The variometer set takes up so much room. It is true that the variometer set requires more room than other types of hook-up. The variometers must not be placed too close together; however, by placing a shield between them space may be conserved. I placed the detector tube between the grid and plate variometers in my set and had good success.

Complaint number four: The variometer set costs more to build than other sets. This is primarily due to two reasons—the extra space required, as the panel must be somewhat larger for the detector and consequently a larger cabinet is required, and the variometer if of first class design and accurately constructed constitutes a higher price article.

Referring to the diagram the various elements are as follows: The variocoupler is shown at a, having 60 turns of No. 24 gauge, cotton-covered magnet wire on the stator (1) and with ten taps (3) connected to the variable switch, shown at b. The center terminal (4) of the switch is connected to a 43-plate variable condenser (*c*) of .0005 microfarads capacity. The rotor 2 of the variocoupler a has 40 turns of No. 24 gauge, cotton-covered magnet wire. A wire 5 connects one terminal of the variocoupler rotor a to one terminal of the variometer d. The variometer d and e are constructed with 56 turns of No. 24 gauge, cotton-covered wire on rotor and stator. The electrical connection between rotor and stator must be positive so that the winding is continuous, there being two terminals on the complete instrument. The variometer d is known as the grid variometer and the variometer e the plate variometer. The detector tube, which is a Radiotron U. V. 200, is shown at f. A grid leak and grid condenser of mica construction and having a fixed capacity of .00025 mfd. is shown at g, connected between one terminal of the variometer d and the grid 6 of the detector tube. The plate "B" battery shown at h is a 22½-volt Eveready T22-15 cell, with its positive terminal connected to the plate (7) of the tube f, and its negative terminal connected to one terminal of the variometer e. An "A" battery is shown at j, and used to heat the filament (8) of the detector tube f, and also the filaments of the amplifier tubes. The negative side of the "A" battery, shown at j, is connected to the remaining terminal of the variocoupler rotor 2, shown at a. Another lead is taken from the positive side of the "A" battery for the remaining terminals of the tube filaments. The filament 8 of the detector tube f is connected to the "A" battery circuit by taking a wire from one of its terminals direct to the negative side of the "A" battery. The remaining terminal is connected to one terminal of the rheostat k, the other terminal of the rheostat being connected to the positive wire of the "A" battery. A telephone jack (1) is inserted between the one remaining terminal of the plate variometer (e) and the positive side of the "A" battery. This completes the detector circuit, and by plugging in the head set nearby stations should be heard.

The tuning in is effected by turning the coupler and grid variometers (d) back and forth, first one way and then the other, and, at intervals, moving the coupler switch (b) to intermediate steps until a signal is heard. As soon as a signal is heard leave the coupler and tune as closely as you can with the grid variometer (d), then move the plate variometer until the signals are clearest. The signals may be brought in clearer sometimes by adjusting the tube rheostat (k) slightly one way or the other.

Best results are obtained by the addition of one or more stages of amplification. In the circuit shown two stages of amplification are used. The amplifiers consist of the tubes shown at m and n, and are Radiotron U. V. 201. Amplifying transformers are shown at o and p, and plate batteries of 43-volt T22-27 cells each are shown at q and r. The primary (9) of the transformer o is connected through

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the telephone jack (1) to the plate variometer (e) and the positive wire of the "A" battery. The secondary winding (10) of the transformer o is connected to the grid of the amplifier tube m and the negative wire of the "A" battery. The plate of the amplifying tube m is connected to the positive side of the "B" battery (q), the negative terminal of this battery being connected to the primary of the second transformer (p). The filament of the tube m is connected direct to the negative wire of the "A" battery and the rheostat to the positive wire of the "A" battery. The remaining terminal of the transformer (p) is connected to the positive side of the "A" battery. One terminal of the secondary

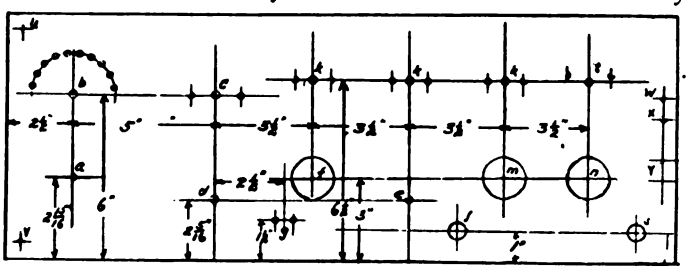

Fig. 2. Panel layout for set described herewith.

winding of the transformer (p) is connected to the negative lead of the "A" battery and the other terminal to the grid of the amplifying tube (n). The plate of the tube is connected to the positive side of the second "B" battery (r), which is identical with the "B" battery shown at q. The negative side of this battery is connected to the telephone jack (s). A wire is then connected to the remaining terminal of the telephone jack (s) and the center terminal of the potentiometer (t). The two terminals of the potentiometer are connected between the two leads of the "A" battery.

The layout of the panel is shown in Fig. 2. The panel is of bakelite, 3/16 inch thick, 8 inches high and 24 inches long. The locations of the various instruments are shown by letters, a being the variocoupler, b the coupler rheostat, c the variable condenser, d the grid variometer, e the plate variometer, f the sight hole for the detector tube, g the grid leak fixed condenser, k the tube filament rheostats, l the telephone jack for detector only, m and n the amplifying tubes' sight holes, s the telephone jack, and t the potentiometer. The lead-in binding post is located at u, the ground binding post at v, the "A" battery negative binding post at w, the "A" battery positive binding post at x, and binding posts for the loud-speaker at y.

In Fig. 3 is shown a front elevation of the panel A, a plan view of the cabinet B, and the various connections diagrammatically. The primary or antennae circuit consists of the lead-in shown at 1, connected to the binding post 2. A connection is taken from this binding post 2 to the binding post 3 of the variocoupler a. The ten taps from the primary winding of the variocoupler are shown at 4. The variocoupler switch 5 has a connection taken from its center terminal 6 to the terminal 7 of the variable condenser C. Another connection is made at terminal 8 of the variable condenser c to the ground binding post 9, from which a wire 10 goes to ground 11. The ground is preferably a water pipe; however, an iron stake driven into moist earth will give satisfactory results.

The secondary high-frequency circuit starts with the rotor of the variocoupler a. The rotor has two binding posts, 12 and 13. A wire 14 is attached to the binding post 13 and connects at its other end to the binding post 15 of the potentiometer and thence to the negative binding post w. Another outside connection is made between this binding post and the negative terminal of the "A" battery, shown at j. The second wire 16 is taken from the variocoupler terminal 13 and connects to the terminal 17 of the variometer d. The remaining variometer terminal 18 is connected to the grid terminal marked G of the detector tube f through the grid leak and fixed condenser g, mounted on the panel. The plate terminal marked P of the detector tube f is connected by the conductor 19 to the positive terminal of the 22½-volt "B" battery h. Another conductor 20 is attached to the negative terminal of this battery and attaches to the terminal 21 of the plate variometer e. The other terminal, 22, of the plate variometer e is connected, through the telephone jack l, to the primary terminal marked P of the transformer o. The other terminal of the primary coil of the transformer is connected to the negative wire 14 at the point 23 after passing through the telephone jack l. The positive wire of the "A" battery is shown at 24, and starts with the terminal marked F of the filament of the detector tube f. This conductor attaches to the terminal 25 of the potentiometer t, and has a lead 26 taken off at this point, which connects to the positive binding post x. An outside conductor connects the positive terminal of the "A" battery s, shown at j, to the positive terminal x. The other terminal of the tube filaments, shown at 27, on detector tube f, also amplifier tubes m and n, has a wire 28 connecting it with the filament rheostats k, k, k. The central terminal of the rheostat is connected by wires to the negative wire 14 of the "A" battery. It will also be noticed that one terminal of the transformer secondary coils is connected to the positive wire 24 of the "A" battery, thus completing the circuit supervised by the

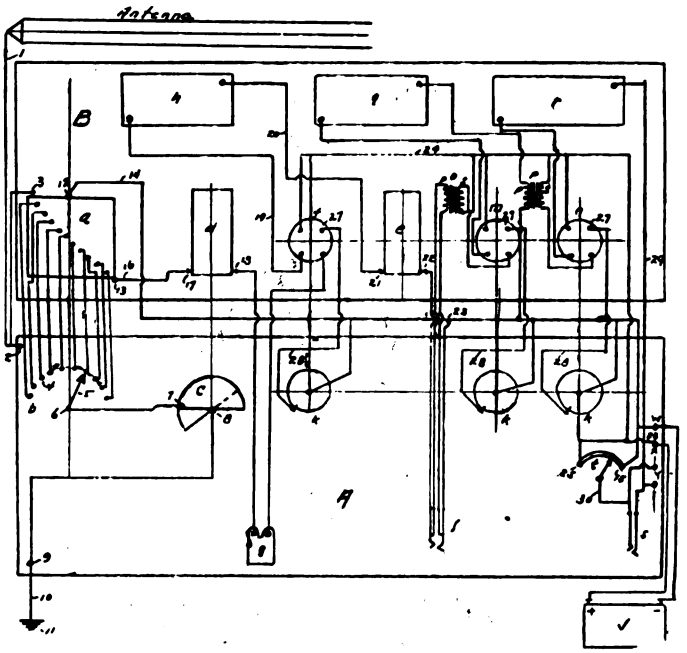

Fig. 3. Plan view of set showing location of various instruments and controls.

"A" battery. The other terminal of the secondary coil of the transformers o and p connect to the grid terminals of the amplifier tubes and marked G. The plate terminals marked P of the amplifying tubes m and n connect to the positive terminal of their respective "B" batteries, q and r; the negative terminal of the "B" battery marked q being connected to the primary terminal marked P of the transformer p, and the negative terminal of the "B" battery marked r is connected to the telephone jack s by the conductor 20. The telephone circuit is then completed by taking a connection 30 from the center terminal of the potentiometer t. Taps are also taken off of the conductors 29 and 30 to the loud-speaker binding posts y in the front of the panel.

One important matter that should not be overlooked in building a receiving set is the soldering of the connections. Every connection should be scraped clean and soldered securely to prevent corrosion and looseness. A corroded joint causes a high resistance, and the incoming signals, being weak at best, should be given the least resistance possible. All connections should be made just as short as possible.

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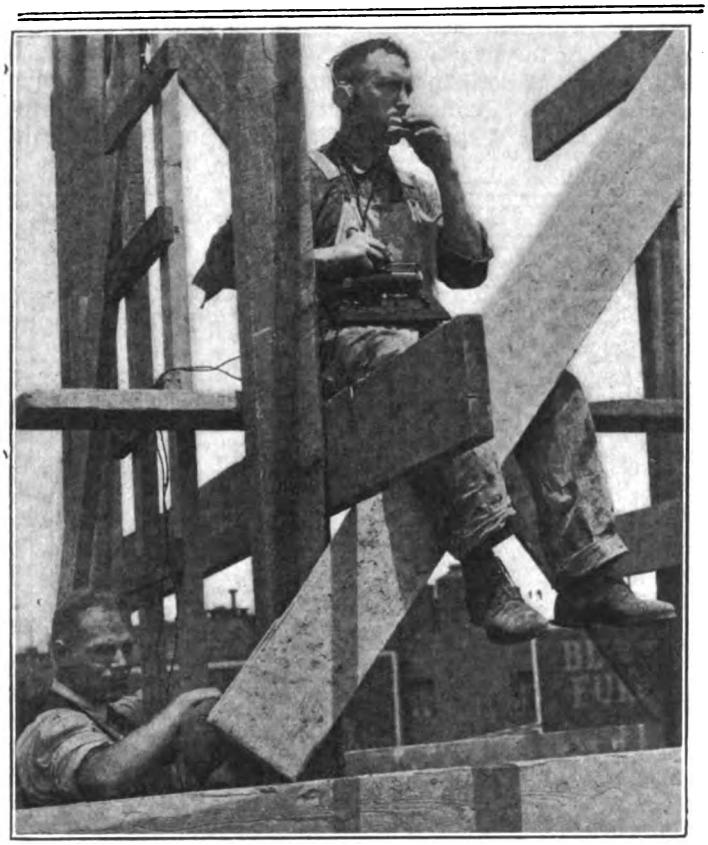
We Hope You Are Not Classified Here

THE chap who tunes by the "beat note" method and successfully establishes a record of being the best hated amateur or broadcast fan in the vicinity.

The pest who is always blowing about his DX accomplishments and then when you show up at his house tells you that he is so sorry "but my B battery just ran down."

The much loved young man who is always making a new set, with the result that his neighbors are kept awake until near morning by his hammering and sawing. And then after he gets it up, are also kept from the arms of Morpheus by his two stage loud speaker with power amplifier.



(C. Kadel and Herbert)

The bug bit him hard, as can be seen by the photograph. He takes his small crystal set along with him, and even though five stories in the air, Michael Bourke manages to enjoy WDT during his lunch hour.

The modest young man who runs over to his neighbor's house with his storage battery and asks to charge it, "because we are going to have a party tonight" and then doesn't invite you.

The bright human being that insists that you "stay just another few seconds—he must be on tonight" and keeps you for several hours while he is hunting for PWX, just when you are too tired to appreciate even Galli-Curci.

The modern scientist who insists on explaining the working of your circuit to you—whether you understand or want him to or not.

The optimist that always laughs when you blow a tube and with an intelligent expression tells you that "you can get plenty more in the stores."

The entertainer who insists on singing seventeen choruses of that popular and idiotic ditty, "Yes, we have no bananas."

Active Broadcasters Total 595

THERE were 595 active radio broadcasting stations on June 16, according to the Department of Commerce records. Of these stations, 180 are in Class A, 42 in Class B, 372 in Class C, and 1 in the experimental Class. A gain of four stations is shown over the survey made on the first of June.

During the past two weeks, 16 stations stopped transmitting and failed to renew their licenses. One new B station, located at Zion, Ill., and eight new Class A broadcasters were licensed last week, and seven Class C stations in as many states, operating on 360 meters transferred to Class A with special wave lengths. One of the new A stations licensed is in Lihue, Hawaii, which brings the total broadcasters in Hawaii to four, the three others continuing as Class C stations.

The list of stations licensed and transferred in the past week follows:

Call	New Class A Stations	Kcys.	Meters	Watts
KFHQ	Curtis Bros. Hardware Store, Los Gatos, Cal.	1,240	242	5
WABM	Doherty, F. E., Saginaw, Mich.	1,180	254	100
KFHS	Dow, Clifford J., Lihue, Hawaii	1,090	275	30
WRAX	Flexon's Garage, Gloucester City, N. J.	1,120	268	50
WRAW	Good, Horace D., Reading, Pa.	1,260	238	10
WABN	Grover, Waldo C., La Crosse, Wis.	1,280	234	100
WABO	Lake Avenue Baptist Church, Rochester, N. Y.	1,190	252	30
WDBF	Phillips, Robert G., Youngstown, O.	1,150	261	50
	TRANSFERRED CLASS C TO CLASS A			
WQAL	Cole County Tel. & Tel. Co., Mattoon, Ill.	1,160	258	10
WEAA	Fallain & Lathrop, Flint, Mich.	1,070	280	150
WMAN	First Baptist Church, Columbus, O.	1,050	286	20
WQAV	Huntington & Guerry, Inc., Greenville, S. C.	1,160	258	15
KLN	Monterey Electrical Shop, Monterey, Cal.	1,150	261	10
WCAD	St. Lawrence University, Canton, N. Y.	1,070	280	50
WEAN	Shepard Co., The, Providence, R. I.	1,100	273	100
	NEW LIMITED CLASS B STATION			
WCBD	Voliva, Wilber Glenn, Zion, Ill.	870	345	500

The Radio Woman

SINCE radio phone conversations have become so common, the old time gossip who used to take such pleasure in imparting deep, deep secrets and little bits of scandal has had quite a set-back. What formerly was common gossip and choice tid-bits are now universal knowledge to anyone with a sensitive receiver.

* * *

It used to be that a girl always respected and envied the other girl whose male friends had automobiles. Now the girl who knows a fellow who has a broadcasting or amateur phone station is the one upon whom the envy falls. And doesn't she just love to talk about "Joe's set," or "When Philly operates!"

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Radio West Point Graduates Sixty-five Experts

By Carl H. Butman

GENERAL George O. Squier, Chief Signal Officer of the Army, presided at the graduation exercises at Camp Alfred Vail, New Jersey, a few days ago, when sixty-five officers received certificates as signal officers. They all completed a ten months' course in communication work, including radio in its many phases, and now have been ordered back to their regular duties with cavalry, artillery, infantry, and other arms of the service where they will act as communication specialists.

In addition to 60 regular U. S. Army Officers, there were among the graduates of the Signal School two members of the Marine Corps, one Philippine Scout, and two Cuban officers. The school, which is under the supervision of Lt. Col. J. E. Hemphill, and a corps of twelve instructors, is regarded by experts as one of the finest in the country. Many commercial schools of the type are now following the system of instruction laid down by the experts of the Signal Corps. At Camp Vail the students have the benefit of a fine laboratory and every type of radio, telegraph and telephone equipment from the lowly spark and crystal sets to the latest type of high powered tube transmitters and receivers. From the surplus material left over from the war-time equipment and new apparatus, practically every radio device known to the world is at hand for experimental and test work.

Besides the regular courses under officers of the Signal Corps, the students are given the benefit of lectures by radio and communication engineers from the big corporations and manufacturers. They also are taken on trips of inspection to large telegraph and radio terminals where they gain a knowledge of the commercial end of the work.

A little over a month ago a special class of national guard and reserve officers graduated after a six weeks' course in military communications. This special course of 350 hours of instruction, included 96 hours of radio, 31 hours of radio procedure, and 26 hours of code practice. The aim of the special course is to fit reserve and militia officers in the elements of wire and wireless communication, and school them all in the actual transmission and reception of code messages.

(C. Fotograms)
Misses Mildred and Dorothy Knapp, of Minneapolis, Minn., have taken advantage of the daily calisthenic drill on the radio program of one of the local broadcasting stations, and get up bright and early to enjoy their "daily dozen" before breakfast.

Naval Radio Monitor Control

THE question of what "monitor control" is seems to be worrying a number of radio fans who try to keep abreast of the rapidly advancing art of radio communication.

Most of them know what remote control is, the expression itself practically indicating the method of operating a distant transmitter by land lines.

Monitor control is a similar method of receiving at a station removed from local electrical interference, and transmitting the signals by land lines to the central office. A radio engineer or expert radio-man stands watch in the distant receiving station and sees to it that the receiving sets are tuned in and functioning properly during the reception of a message.

The Navy monitor control system, now used at San Francisco, San Diego and at the Radio Central in Washington, is a refinement of duplex operation. Three units, instead of one are operated; the transmitting station, the monitor receiving station, and the control or central operating office. This system is employed in the interest of efficient administration, rapidity of service and elimination of errors due to land wire relays, all activities being controlled at administrative headquarters or central office. Headquarters are frequently located where there would be interference from electric power lines or unfavorable atmospheric conditions for radio reception.

To overcome these difficulties, a monitor collecting or receiving station is established at a place free from all electrical disturbance. Signals are there received on overhead antenna or loops, and are impinged through suitable coils, on land wire loops, called "tone channels" composed of two land wire circuits between the monitor and the administration station, where the signals are transferred through suitable coils to the operator's head phones. By this method, operators are relieved of all functions except operating.

A large number of messages for simultaneous transmission and reception, including duplexing, can be handled, at the same time from Administration Headquarters. At San Diego, the monitor station is located at Point Loma, eight miles from District Headquarters. All incoming signals are monitored from Point Loma to headquarters. All outgoing signals are sent from headquarters, the operator at headquarters controlling the transmitting key at the high-power transmitting station at Chollas Heights, 12 miles from San Diego by land wire.

The monitor station is located on the roof of the Navy Department in Washington, as little electrical interference in that part of the city is found.

Newsdealers Will Deliver Radio World to Your Home

If you have daily, weekly or monthly publications delivered to your home, you can also instruct your dealer to deliver RADIO WORLD with your other papers.

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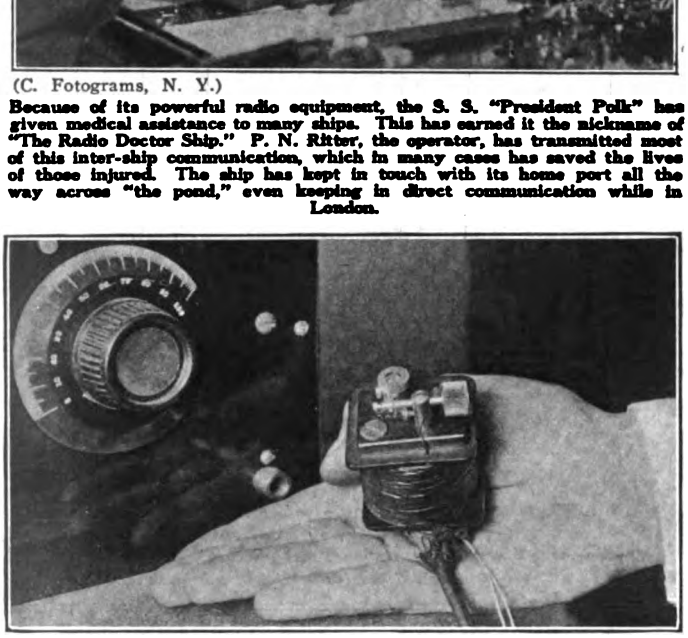
Here's Another News Pic
And A Few Words on How

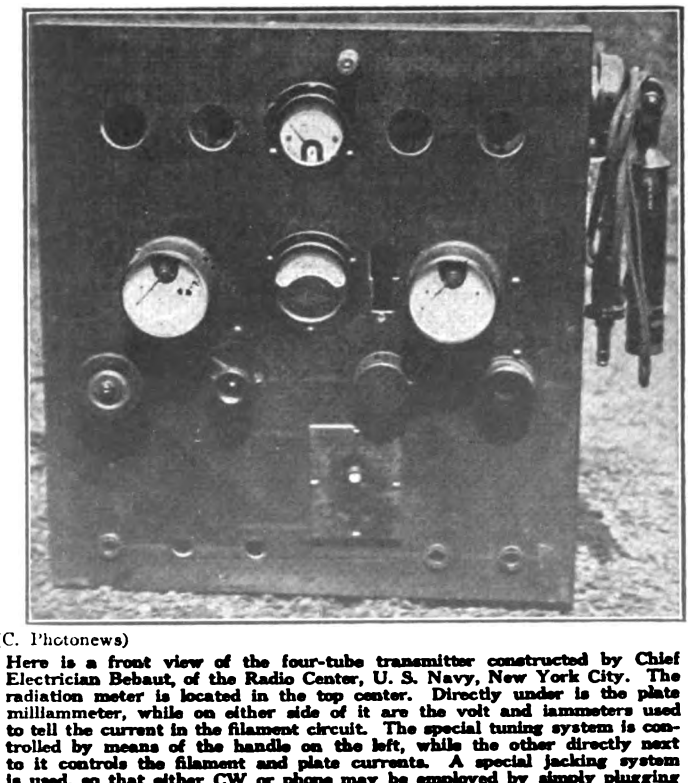
(C. Fotograms, N. Y.)

Because of its powerful radio equipment, the S. S. "President Polk" has given medical assistance to many ships. This has earned it the nickname of "The Radio Doctor Ship." P. N. Ritter, the operator, has transmitted most of this inter-ship communication, which in many cases has saved the lives of those injured. The ship has kept in touch with its home port all the way across "the pond," even keeping in direct communication while in London.



(C. Kadel and Herbert)

Although small in size when compared with its brother, the dial of which is seen in the upper left-hand corner, this minute crystal set is capable of receiving 25 miles. It consists of a tiny fixed inductance, a condenser and crystal detector, with a common pin for a catwhisker.



(C. Photonews)

Here is a front view of the four-tube transmitter constructed by Chief Electrician Bebaut, of the Radio Center, U. S. Navy, New York City. The radiation meter is located in the top center. Directly under is the plate milliammeter, while on either side of it are the volt and ammeters used to tell the current in the filament circuit. The special tuning system is controlled by means of the handle on the left, while the other directly next to it controls the filament and plate currents. A special jacking system is used, so that either CW or phone may be employed by simply plugging in the correct instrument.

(C. Kadel and Herbert)

A demonstration was recently held at the Bronx Zoological Park, New York City, to determine the effect of radio music on wild animals. It is quite evident that the lion doesn't appreciate it in the least, which same is also shown in the "hit and run" position of Keeper John Toomey.

(C. Photonews)

Olle D. Engstrom, 163 East 69th Street, a student at the Polytechnic Institute, Brooklyn, N. Y., and his radio car, which he has perfected. It can easily be operated by a distant transmitter, obeying the operator's signals instantly and without a murmer of dissent.

(C. Kadel and Herbert)

Leonard F. Plummer, who delivers letters by day and copies letters by night by means of the radio set he constructed. It is an example of very neat workmanship and careful planning. Due to the fact that most of the parts were second-hand, being bought from his friends, he constructed the set (not counting the tubes or phones) for a cost of exactly $20.00.

How Radio World G
It's Photographs

TO many people is a constant of wonder how the photographs lished in RADIO WORLD are secu order to keep them supplied with the la news.

Besides its own photographers, WORLD has on its staff one of the best photographers in the field. It is the bu of these men to ferret out all the lates penings and immediately make concre dence of them by the aid of the "ever- eye" of the camera.

Easy as this sounds it is quite a thing, because it may happen that the p rapher only overhears someone men happening or incident and then is le momentary loss as to where it happe who did it, or why it happened. To th inspired camera man this may mean around a city, seeking, probing and qu ing until he finally clicks his camera, s in the knowledge that his picture st finally and faithfully has been secured.

Of course, if there is a parade or a nary every-day occurrence it is quite e him to get his picture. But consider that the incident may necessitate his c up a big building under construction, tall radio mast, or on a precipitou in order that he may faithfully reproc incident for the public edification.

In order faithfully to serve both and us, the camera man must be up toes every minute of the day and ni cause it is no indication that just be is 5.30 that the world has gone to sl is ever prepared, day or night, to "sh subjects (in a kindly way, not otherw must have a wonderful store of inge order to gain entrance to places that tically "taboo." He doesn't know words as "It can't be done." Royalty mean nothing to him as long as he click his shutter and take away his Fear has no meaning in his vocabula simply another word—and he must in anything simply because it necessi comfort or a chance for a good fa ever alert and ever watchful.

These are just a few of the reas RADIO WORLD can give you "the nev tures" weeks ahead of any of the ra azines. With a staff of competent wakeful men constantly "on the job" ers are able to visualize the radio nev as soon as it happens.

And then, after the photogra been received by RADIO WORLD, they dergo a careful editorial scrutiny be are passed along to the engravers w the half-tone plates from which printed.

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(C. Kadel and Herbert)

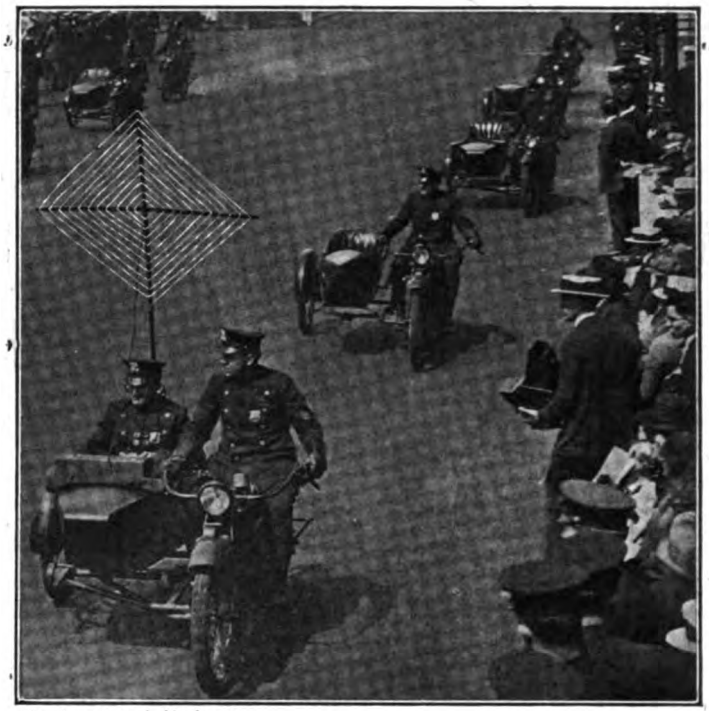
Wave meter which on account of its small size is a favorite among the radio operators of the French Army. An interesting point is the fact that the condenser dial is calibrated in meters instead of capacity and direct reading is therefore possible. Corporal P. Famelio, of the 212 Anti-Aircraft Artillery, is pointing to the small fixed crystal detector which is used.

(C. P. and A. Photos)

Just to be different, these two boys equipped their bicycle with a sidecar and stuck a portable loop set on it, during the parade which opened Boy's Week in Philadelphia, Pa.

(C. Fotograms)

In keeping with his motto of "Make your boy a radio fan and keep him off the streets," Mayor George E. Leach of Minneapolis, who is an ardent fan himself, has had this portable loop receiver installed right on his desk so that he can keep in touch with the latest in radio and news during his few spare moments throughout the day.



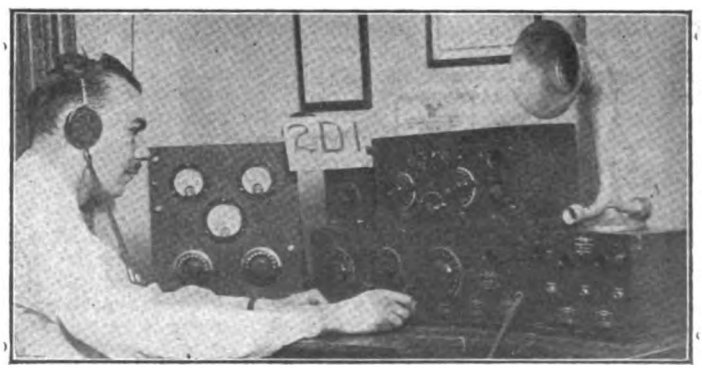
(C. Kadel and Herbert)

The latest foe to crime are these radio-equipped motorcycles, which were introduced to New Yorkers during the opening parade of the New York City Silver Jubilee. A powerful tube set is used employing a loop as shown by means of which the rider can keep in touch with headquarters and receive instructions.

Captions by Robert L. Dougherty

(C. Underwood and Underwood)

Captain D. C. Hanrahan, U. S. N., Commander of the scout cruiser "Omaha," the newest and fastest addition to the U. S. Navy, in his "remote control station" which is a part of the latest "speedster of the seas." It was from this station that the first radio telephone conversation between Hilo and Honolulu was conducted.



(C. Photonews)

Dr. E. A. Cyriax, assistant manager of the second district, A. R. R. L., and his radio station 2DI. Two transmitters are used, one a half kilowatt 500-cycle Telefunken spark, and the other a 50-watt CW set. for receiving a Grebe CR8 with two stages of audio-frequency is used. He has made several long distance records both in transmitting and reception.

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New York Amateur Builds a Neat, Compact, Portable Receiver

By Captain Adrienne Le Page

AS the trend of all construction in radio sets these days seems to follow in the tracks of "making it as small as possible," it is not at all surprising that some very fine portable sets have been made. One of the neatest and most workmanlike of these has been constructed by Bob Kalmus, a New York amateur. The set is illustrated on the front cover of this issue.

A particular point of interest in the set is the fact that the new U. V. 199 tubes are used. They lend themselves very well to sets of this type, as they are extremely small and also because they can easily be used with portable sets, as they use dry cells.

The tuning of this set is accomplished by two special variometers which are of the honeycomb coil wound type, and as can be seen take up very little space in the set. They are so placed that they are inductively related to each other. This mounting does away with the necessity of varying the coupling, as the best point was found through experimentation and then the set was constructed.

There are two stages of audio-frequency amplification used, and the transformers are mounted in such a manner that they will not cause howling. This is accomplished by mounting them at right angles to each other, and separating them quite a distance.

The extreme neatness of construction of this set should prove to prospective builders of sets that it pays to be neat. Before this set was made, the builder spent many hours planning the panel and the location of the instruments, so that they would take up as little space as possible, yet not make the wiring too intricate, or have the instruments interfere with one another electrically.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Naval Radio Station NSS, Annapolis, Md., transmits time signals daily between 3:55 and 4:00 a. m., Eastern Standard Time, on 17,145 meters.

* * *

General John J. Carty, chief engineer and vice-president of the American Telephone & Telegraph Company, received the honorary degree of Doctor of Science from Princeton University at the recent annual commencement.

* * *

Lieutenant Wilbur J. Ruble, U. S. N., who has been Fleet Radio Officer, Scouting Fleet, stationed on the U. S. S. "Wyoming," has been designated as Fleet Radio Officer of the Battle Fleet under Admiral Robison, and will be transferred to the U. S. S. "California."

* * *

A program of French music will be broadcast from WGY Schenectady, N. Y., on the night of July 5 under the direction of Professor Joseph Brodeur, organist and choir director of the Cathedral of the Immaculate Conception of Albany, N. Y. Professor Brodeur will deliver an address on "French Canadians and Their Music."

* * *

An X-ray treatment lasting 56 hours was applied to a woman cancer patient at Bellevue Hospital, New York City, last week. A voltage of 250,000 was used, and the X-rays generated were powerful enough to outline the bones of the hand at a distance of 200 feet. The patient was protected by silk and lead screens, took food and water, and occasionally slept during the treatment, which is said to be the longest on record.

* * *

Capt. Roald Amundsen, the Arctic explorer, definitely has abandoned his long-heralded flight over the North Pole in an airplane. According to a message sent to his brother, Amundsen made a trial flight on May 11 somewhere near Point Barrow. It was so unsatisfactory that the proposed flight over the pole was called off. Much had been expected of the trip by aeronauts and radio experts, as the plans called for frequent communication with Point Barrow and Spitzbergen, the final terminus of the flight.

* * *

The concerts at the stadium of the College of the City of New York, beginning this year on July 5, to run six weeks, are to be enjoyed by millions instead of the 10,000 or 15,000 of other years. They will be heard at sea, in New Orleans and Canada, past the Mississippi River and on moving trains. The music is to go out by an elaborated system of radio, and broadcast more completely than any symphony in the history of radio by the Radio Corporation of America from the Aeolian Building. Not every concert thus will be sent out, but at least two or three a week.

A. Orsi, a radio engineer of Rome, Italy, informs RADIO WORLD that Italy will now permit free radio reception, which formerly was limited to a few stations.

* * *

Station WSB, Atlanta, Ga., celebrated its first anniversary June 13. It is estimated that about 100 receiving sets in Atlanta heard the first program and that over 50,000 listened in to the birthday celebration.

* * *

Miss Vaughn De Leath, managing director, informs RADIO WORLD that the studio acoustics of Station WDT, New York City, have been properly adjusted, and that active broadcasting has been resumed.

* * *

Commander S. C. Hooper, in charge of radio engineering in the Navy, it is reported, will become Fleet Radio Officer under Admiral Coontz when the latter assumes command of the fleet early in August.

* * *

"Radio rapidly is becoming a public servant of great value, and has in it the promise of a new democracy of thought, culture and universal contact that will touch more people than ever have been reached by any agency, with the possible exception of the printing press."—Powel Crosley, Jr.

* * *

Comparison of the annual reports of the two electrical giants, General Electric and Westinghouse Electric, shows both took full advantage of resumption of business activity last year, and strengthened their respective positions in preparation for a record volume of orders expected in 1923 and subsequently.

* * *

Donald C. A. Butts, connected with the Pennsylvania State Department of Health, has announced his belief that cancer is caused by an excess of positive electric ions, or energy, in cells where cancerous growths have developed. It is only when certain cells are exposed to constant irritation, generation after generation, that a pre-disposition to cancer is inherited.

* * *

In a final tryout of the Belin telautogramme, or telegraphic transmission of written script, which is to be placed at the disposal of the public in a few days, 1,453 words were transmitted in six minutes, according to a Paris cable to the New York *Times*. The document covered 128 square centimetres, and, at prescribed rates, would cost the sender twenty francs. Under ordinary transmission by telegraph the document would require twenty-five minutes for transmission, and cost the sender 218 francs. The telautogramme was sent from Lyons to Malmaison, near Paris.

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Answers to Readers of Radio World

I have constructed the Flewelling set as described in RADIO WORLD *for February 24, using mica condensers and Freshman grid leaks. The coils I wound myself. The set only responds to CFCN. I get that station very loud but nothing else. What can I do to remedy this condition?—D. P. Hartley, Jasper, Alta, Canada.*

As previously stated, this set is difficult to work. Would advise you resetting your grid leaks as spoken of in the article until the high frequency whistle is so high that it is almost inaudible. If you are not getting this scream or whistle, try switching the leads on your tickler. Also try reversing the minus B lead that goes to the filament. By that we mean instead of the lead that comes from the center of the condenser bank going to the plus of the filament circuit and then to the minus of the B battery, place it so that it goes to the minus of the filament and the minus of the B battery. As to the home made coils would advise trying some ready manufactured ones. You may have the windings wrong, or some condition may be present that would cause your set to function as it does. Watch all your connections and see that they are properly insulated and that they cross at right angles. When they are in close proximity it is best to insulate them by means of rubber tubing or varnished cambric (spaghetti). Also experiment by reversing the two coils, using the 50 as tickler and the 75 as primary and vice versa. Be careful about your soldered connections and see that the flux used in soldering has not spread. If this is the case wash the connections with alcohol to remove the excess flux. Be careful when using alcohol on or around rubber panels. If you are using a loop, try connecting the ground side of the circuit which connects to the loop through a condenser to the ground. This sometimes helps on loop reception. In any event be very careful of your construction on the condenser bank. If there should be anything wrong in this bank your set would function, but not in the correct manner, and your reception would be seriously hindered.

* * *

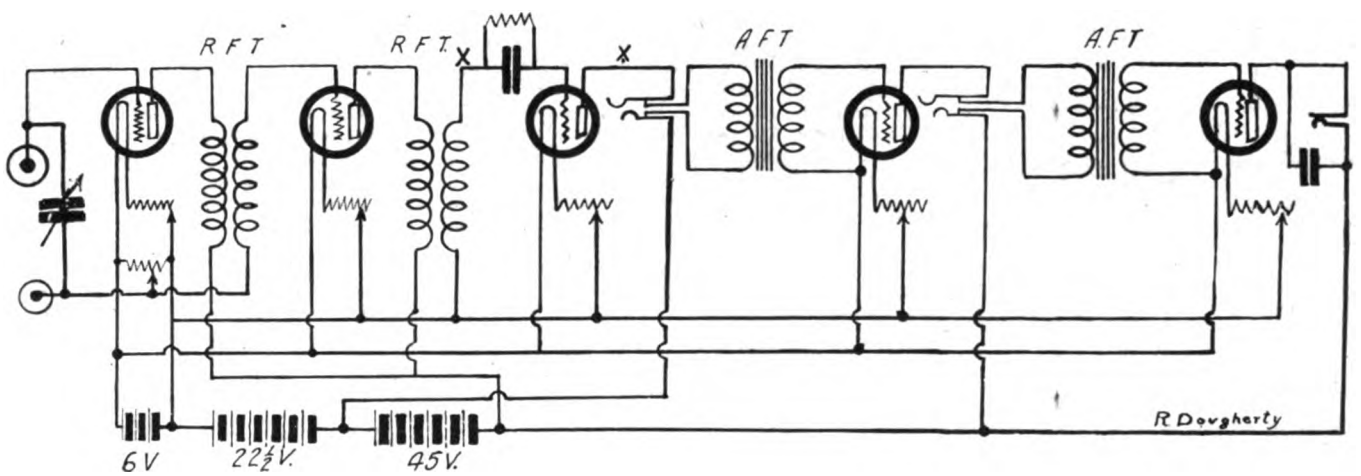
I constructed the enclosed receiver (three-unit honeycomb set) from a hook-up in RADIO WORLD. *I added the two-stage amplifier shown in the March 31 issue of* RADIO WORLD *and I cannot get it to work. All it does is squeal and howl. How can I remedy it?—Roy Smith, Lock Box 13, Millersburg, Ohio.*

The amplifier hook-up you mention was specified for the Flewelling circuit. In order to use it for the circuit you mention it will be necessary to remove the grid leak across the input of the first transformer. This is a standard two-stage audio-frequency amplifier, and will work, when the grid leak is removed, with the three-circuit receiver.

* * *

I desire to build a set that is capable of getting distant stations, and have been advised to build one incorporating two stages of radio-frequency, detector and two stages of audio-frequency. Will you please give me a hook-up for same? Can such a set be used with a loop, or are antenna and ground with a coupler necessary?—A. L. Hallam, 12 Ludlow Street, Yonkers, N. Y.

The hook-up you desire is herewith printed. It is possible to use either loop or antenna, ground and coupler with such a set. You can use either by simply connecting them across the leads shown at the extreme right. When a loop is used it will be necessary for you to shunt a variable condenser across the terminals of the loop to get tuning.



Hook-up given in answer to request of A. L. Hallam. It is two stages of radio-frequency, detector and two stages of audio-frequency. If regeneration is desired it can be obtained by simply inserting variometers in the grid and plate leads at the places marked X X in the diagram. Note that there is a 200 ohm potentiometer in the filament leads of the first tube.

* * *

In RADIO WORLD *for June 2 you published a reflex circuit by W. S. Thompson. What make of R. F. and A. F. transformers are used in this circuit? In the May 19 issue you published an improved Grimes circuit by W. S. Thompson. What make of R. F. and A. F. transformers are used in this circuit? What do you find is the average reception of this set using a loop antenna? Using an average ground and antenna? What are the proper connections for the transformers? Is it necessary to shield the panel when constructing this latter circuit? —Alfred Wagstaff, 500 Fifth Avenue, New York City; Earl W. Hoover, 309 Slocum Avenue, Syracuse, N. Y.; A Constant* RADIO WORLD *Reader, Booneville, Ind.*

It is impossible for us to specify competitive apparatus. In regard to transformers, buy the best you can get. This also applies to all other apparatus necessary to build a set. It is impossible accurately to state even the average range of any type of receiver as there are too many conditions that have to be considered. Send a self-addressed and stamped envelope to the writer of the article, care of RADIO WORLD. The letter will be forwarded to him, and your question will be answered direct. In any of the very selective and sensitive circuits it is best to shield the panel. This will lessen any chance of capacity effects.

* * *

I want to build a set that will enable me to reach from coast to coast. Will a vario-coupler variometer set enable me to do this? —L. A. Boyd, Route 1, Box 335, Hammond, Ind.

You might be able to do as you wish to by using this type of receiver, but would advise using a circuit that embodies radio-frequency amplification. If you desire to construct such a set see hook-up on this page. If you do not desire to incorporate more than three tubes the two stages of audio-frequency amplification can be left off.

* * *

In connection with the Reinartz circuit, how many turns should be put on the coils to enable me to reach all the broadcasters? What is a choke coil core constructed of? —Phil Soucy, 895 Aurora Avenue, St. Paul, Minn.

We refer you to RADIO WORLD for January 13, where you will find the information you desire, on page 23, in answer to a question similar to your own. The circuit also appears on that page, with all constants marked. The core of a choke coil is generally constructed of soft Swedish steel. Sometimes they use what are called air core chokes, and these are designated as common coils. The metallic cored choke has a lot of parallel lines shown drawn through the center.

* * *

I have constructed the set described in RADIO WORLD *for January 13, column two, circuit No. 3. I have made it without putting the condenser in the plate circuit, and it will not work. Is this condenser absolutely necessary? What is the capacity of it? Will it work when the condenser is put in?— Gorham G. Winchester, 213 Waldo Street, Providence, R. I.*

It is absolutely necessary that every circuit be constructed just as the description and diagram state. See article on page two of RADIO WORLD for June 23. It explains why. The capacity of the condenser should be .0005.

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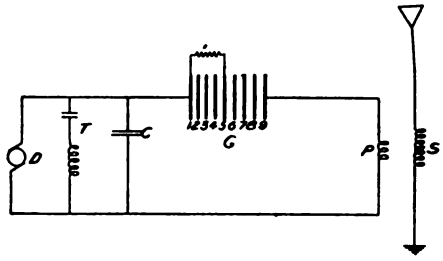
Latest Radio Patents

Radiotransmitter

No. 1,452,864: Patented April 17, 1923. Patentee: Vannevar Bush, Chelsea, Mass.

The present invention relates to radio transmitters having a primary or closed circuit of the impact type in which a series of unidirectional pulses are produced

The best known types of commercial transmitting apparatus embody an oscillating primary circuit having a spark gap and a secondary or antenna circuit tuned in resonance with the primary circuit and giving off group trains of waves. The efficient operation of this type of transmitter is dependent directly upon an accurate tuning of the two circuits, as otherwise the transference of a substantial amount of energy to the antenna circuit is precluded and the radiated energy from this latter circuit decreases rapidly. This accurate



Method of producing equal damping in spark signals.

tuning of the two circuits is difficult to obtain under ordinary conditions, and this difficulty is more particularly evident in connection with ship, aeroplane, or portable installations where the antenna capacity changes rapidly.

The resurgence of current in a persistently oscillating primary circuit, moreover, tends to heat the gap and dissipate the useful energy in the circuit, and attempts have been made to overcome these objectionable features by the provision of a form of gap which quenches or damps the oscillation, and also by providing means for artificially dissipating the heat which is generated in the gap. However, the interposition of this quenched type of gap in the primary circuit renders even more acute the difficulties due to a de-tuning of the two circuits which causes an irregular quenching action and a variation from the desired smooth tune.

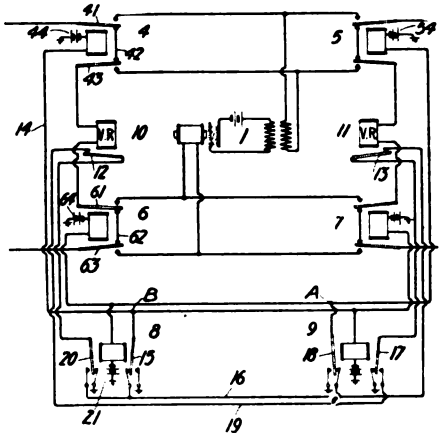
The ideal condition for a primary circuit is that in which a single loop of unidirectional current passes through the gap at each discharge of the condenser, thus ensuring the utilization of the maximum amount of energy and permitting the efficient coupling of two circuits which are not in resonance.

Repeated attempts have been made to secure a rectifying spark gap of this character which would cause the flow of a unidirectional current in the primary circuit, but these constructions have universally failed to attain the desired result, either because of the complicated and intricate nature of the constructions employed and the extremely delicate adjustments required to cause the apparatus to function in the desired manner, or because of a misunderstanding of the principles involved.

Repeater System

No. 1,455,957: Patented May 22, 1923. Patentee: E. D. Johnson, East Orange, N. J.

THIS invention relates to repeater circuits in which a one-way repeater is reversibly connected in a transmission circuit to provide for the two-way transmission of signals. An object of the invention is to provide means for connecting the repeater in circuit automatically and in response to current such as voice current impressed on the line. This is accomplished, giving rise to a very positive con-



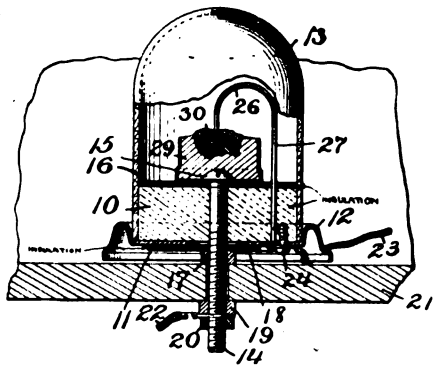
Method used for duplex or two-way transmission.

trol of the circuit connections, by providing a voice-operated relay for each of the two line terminals or sections, the operation of either relay in response to current impressed on its corresponding line section serving not only to connect the repeater properly in circuit but also to change the connections of the other control relay so that these relays will assist each other in maintaining the repeater properly connected. The assistance of the second or subsequently operated relay is of material advantage, for this second relay in the embodiment chosen to illustrate the invention and its various aspects, is connected in the output circuit of the repeater and accordingly energized.

Crystal Detector

No. 1,454,997: Patented May 15, 1923. Patentees: G. Greco and K. G. Wolff, Newark, N. J.

THIS invention relates to an improved crystal detector for wireless receiving sets, and is adapted to be placed in position in a set and is easily accessible for



Improved dustproof crystal detector.

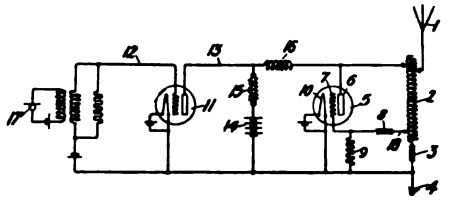
adjustment, if the small wire engaging the piece of crystal becomes dislodged from a detecting point, by the removal of the dust-proof cover, which cover fits over a block.

Oscillating Generator for Signaling Systems

No. 1,452,032: Patented April 17, 1923. Patentee: John F. Farrington, New York, N. Y.

This invention relates to oscillation generators, and more particularly to those of the vacuum tube type, and radio systems empolying such generators.

An object o fthe invention is to provide means for oscillation generators of the kind herein described whereby the feed-back coupling and hence the amplitude of oscillations can be adjusted without changing the frequency of the generated oscillations. In a transmitting station this is of importance, as the necessary adjustment of the oscillator can be made without changing the transmitted wave length. For purposes



Method employed to change the oscillatory circuit without changing the frequency.

of illustration, an oscillation generator of the audion or three-electrode vacuum tube type is employed.

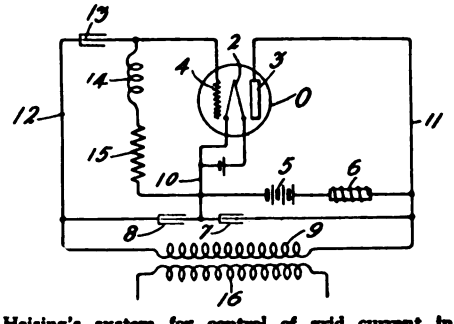
Electrical Discharge Device

No. 1,452,330: Patented April 17, 1923. Patentee: Raymond A. Heising, East Orange, N. J.

This invention relates to electric discharge devices and more particularly to arrangements for using such devices to generate, repeat or amplify electric currents.

Herefore use has been made of a high resistance leak path to discharge undesired electrical charges which accumulate upon the grid or impedance-varying element of highly evacuated electronic discharge devices. It has been found that high frequency energy is dissipated because of this resistance, thereby lowering the efficiency of such devices; and a primary object of my invention is to prevent this dissipation of energy. This result is accomplished by the means herein described without causing the leak path resistance to act less efficiently in controlling the potentials upon the grid. This saving of energy may be accomplished by allowing less high frequency current to flow in the leak path, by causing the current which does flow to be substantially wattless, or by a combination of both these effects.

It has been proposed to place the high resistance leak path between the grid and cathode, but it may be located between any two points which will cause the desired leak.



Heising's system for control of grid current in tubes.

The invention is described herein in connection with highly evacuated tubes of the audion type which function as generators, but may obviously be of utility in connection with similar or equivalent discharge devices functioning as detectors, amplifiers, modulators or for other purposes.

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Some Good DX Records

From 'Way Down East

From Franklin M. Dyer, 162 Summer St., Somerville, Mass.

I HAVE been a close follower of your column, and, while I don't pretend to have established much of a DX record, I am submitting the following list of stations heard. I am using the "Greene Concert Receiver" hook-up—a very popular circuit in this section of the country.

Radiophone Broadcasting Stations—CFCA, Toronto, Ont., Canada; CHTC, Montreal, Quebec, Canada; KDKA, Pittsburgh, Pa.; KSD, St. Louis, Mo.; KYW, Chicago, Ill.; NAA, Arlington, Va.; WAAJ, Boston, Mass.; WBAP, Fort Worth, Texas; WBAH, Minneapolis, Minn.; WBZ, Springfield, Mass.; WCAE, Pittsburgh, Pa.; WDAF, Kansas City, Mo.; WDAP, Chicago, Ill.; WEAF, New York City, N. Y.; WFAU, Boston, Mass.; WFI, Philadelphia, Pa.; WGI, Medford Hillside, Mass.; WGM, Atlanta, Ga.; WGY, Schenectady, N. Y.; WHAS, Louisville, Ky.; WHAZ, Troy, N. Y.; WHB, Kansas City, Mo.; WIP, Philadelphia, Pa.; WJZ, Newark, N. J.; WLAK, Bellows Falls, Vt.; WMAK, Lockport, N. Y.; WNAC, Boston, Mass.; WNAV, Knoxville, Tenn.; WOC, Davenport, Ia.; WOO, Philadelphia, Pa.; WOR, Newark, N. J.; WSB, Atlanta, Ga.; WWJ, Detroit, Mich.; WGR, Buffalo, N. Y.; WHA, Madison, Wis.; WHAM, Rochester, N. Y.; WJAX, Cleveland, O.; WLW, Cincinnati, O.; WOAW, Omaha, Neb.; WJY, New York City, N. Y.; WJZ, New York City, N. Y.; AV8, Aviation Squadron, South Armory, Boston, Mass.

Naval and Commercial Radiotelegraph Stations and Ships at Sea—NAD, Charlestown, Mass.; NAF, Newport, R. I.; NAH, New York, N. Y.; NBD, Bar Harbor, Me.; WSA, East Hampton, L. I., N. Y.; KYP, S.S. Oneida; KEXT, S.S. Peter H. Crowell; WRS, S.S. Suffolk; KIVX, S.S. Guardsman; KUTX, S.S. Richconcal; JAH, S.S. Italy Maru (Ja.); YES, S.S. Clan Kenneth (Br.); KRF, S.S. Ramson B. Fuller; KRC, S.S. Camdem; GBWD, S.S. S. Blas (Br.); WCC, Chatham, Mass.; WNY, New Brunswick, N. J.; WCY, Cape May, N. J.; WSC, Siasconset, Mass.; NUGN, U.S.S. Potoka; KEZR, S.S. West Celina; GDO, S.S. Bovic (Br.); TXY, S.S. Breedijk (Du.); NARF, U.S.S. Wandank; KIMQ, S.S. East Side; YRD, S.S. Amarna (Br.); KMOU, S.S. Edward Pierce; KRN, S.S. Calvin Austin; KMM, S.S. Panuco.

Amateur Radiotelegraph Stations—1AAW, 1AF, 1AFT, 1AGM, Massachusetts; 1AJP, Connecticut; 1AKB, Massachusetts; 1ALJ, Connecticut; 1ANY, 1AOH, 1AOK, 1AOR, Massachusetts; 1AQI, 1ARM, ?; 1ASA, 1ASJ, 1ASK, 1ASP, 1AST, Massachusetts; 1AUA, Connecticut; 1AUH, 1BNS, 1BOP, 1BTA, 1BVH, 1BWJ, 1BXC, 1BYG, Massachusetts; 1CDO, Maine; 1CEH, 1CIT, 1CJD, 1CKB, 1COC, 1CPI, 1CPN, Massachusetts; 1CRU, Maine; 1CSH, 1CSX, 1DM, 1EO, 1JI, Massachusetts; 1KX, Maine; 1PL, Massachusetts; 1RA, ?; 1SI, 1SW, 1VV, 1DV, 1MQ, 1ZE, Massachusetts; 2AFP, New Jersey; 2BXW, 2CBC, New York; 2CGR, 2CQ, New Jersey; 2CVJ, 2TS, New York; 3BRW, Pennsylvania; 1AWH, ?; 1AWL, 1AWP, Massachusetts; 1AWU, ?; 1AX, Massachusetts; 1AXJ, Connecticut; 1AXO, ?; 1AXX, Massachusetts; 1AYZ, Connecticut; 1AZE, ?; 1BDI, Maine; 1BDT, Massachusetts; 1BET, ?; 1BHR, 1BJS, 1BLX, Maine; 1BMN, 1BNT, 1BQI, 1BTR, 1BVW, 1JV, 1PF, 1QA, 1SF, 1SN, 1VG, 1WM, 1GS, 1XM, 1WW, Massachusetts; 2AU, 2BYA, 2CG, 2CPA, 2CUZ, 2CVS, New York; 3BEI, New Jersey; 3GC, Pennsylvania; 3TR, Washington, D. C.; 3ZO, 8CKO, 8VN, Pennsylvania; 3XM, New Jersey; 8CKN, 8UF, New York.

This completes the list of stations heard to date. I don't expect that you will want to print all of these, but as so many radio fans in the West are submitting lists of stations heard I couldn't resist the temptation to show them that we, in the East, pick up a few of them also.

I find a great deal of pleasure and help from RADIO WORLD, and I wish you every success.

A Brave and True Aeriola User Makes a Request

From E. E. Williams, Woodston, Kan.

I HAVE been looking over your DX records for some time and decided to send one from Kansas, that may interest the DX nite owls. I have a single tube set (Aeriola Sr) with an aerial 18 feet at one end and 21 at other, 150 feet long from set. The following are a few of the distant stations I have heard:

South PWX, WFAA, WBAP, KOB; North CJCG, CKCK, CFAC, WLAG, WPAK, KYW; East KDKA, WGY, WJZ, WGM, WSB, WDAJ; and West KHJ, KDYL, KFI, KFDB, and many others. I have heard all told 227 stations in United States, 12 in Canada, one in Cuba and one in Old Mexico.

Would be glad to hear from Aeriola Sr. Set users to get something new to try. Will answer all letters and cards.

From the Land o' Cotton

From William Britton, 200 East 19th Street, Jasper, Alabama

HAVING read all the D-X records in Radio World I am now sending in mine. I use a one tube, single circuit regenerative hook-up with Remler, Chelsea, Allen-Bradley, parts in the set. I have heard 80 stations with this set listening in about two hours every night. During the winter I heard an average of 12 stations in two hours listening in. On several occasions I heard fifteen stations in the same time. My aerial is 90 feet long, 30 feet high at the south end and 10 feet high at the north end. The stations I have heard are, WGY, WLAG, WWJ, KYW, WJZ, WDAP, WJAZ, KDKA, WDAR, WDAF, WHB, WDAE, WDAO, WSAT, PWX, WBAV, WOAI, WIAR, WTAW, WEAM, WOAW, KFAF, WAAQ, WHAS, WBAP, WOC, WBAX, KZN, KFFQ, KFI, KWH and also Frank Jones station in Tunicu, Cuba. This only half of the number of stations I have heard.

I want to say a word about single circuit outfits. There is five in town within a radius of one mile of my house and these sets have never bothered me when I was listening in. The above record is not bad for my kind of set, eh, what!

All on the Magnavox

From Ralph Mallon, 33 East 4th St., Columbus, O.

I HAVE a three-step and Magnavox. The following stations were heard Saturday, May 26:

KDKA, 200 miles; WHAS, 200 miles; KFI, 2,079 miles; WDAJ, 500 miles; WJZ*, 550 miles; WJY, 550 miles; WOAW, 690 miles; WGY, 550 miles; WDA*, ship; WJAD*, 1,035 miles; WIP*, 435 miles; PWX, 1,400 miles; WOR, 550 miles; KHJ (speech), 2,070 miles. Total miles, 10,450. Total stations, 14. All of these were on the Magnavox. This record is better than my other record that I sent in. Since April 30 I have received 21 states, without Cuba and ships, numbering 38 stations.

MAGNAVOX
Radio Products

R2 Magnavox Radio *The* Reproducer Supreme

The Utmost in Sound Amplification

Where the reproduction of broadcasted programs is desired in large volume, the Magnavox Reproducer R2 should be used.

Thanks to the Magnavox (electro-dynamic) principle of construction, this result is secured with minimum electrical energy.

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . $90.00

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field $60.00

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . $35.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

Magnavox Radio products can be had of good dealers everywhere. Write for copy of our new booklet.

The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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THE RADIO BUSINESS IS GETTING INTO FINE SHAPE. AS FORBES SAYS: "THE BEST STEEL IS THAT WHICH HAS UNDERGONE THE HARDEST POUNDING."

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. *Telephone Bryant 4796*

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Thos. H. Oliver, 401 West Erie St., Albion, Mich. (Dealer.)
F. M. Olzewski, 201 South Broadway, Baltimore, Md.
Geo. Mulholland, Craigvale, Ontario, Canada. (Will soon enter radio business.)
Sidney Wiswall, Ballston Spa, N. Y.
Kerr B. Cowan, 1532 West Fourth Ave., Corsicana, Tex.
Joseph Jarvine, Junction, Texas.
John H. Whitcomb, 58 Forest St., Keene, N. H.
Wilson's Radio & Electric Shop, Third and Pike Sts., Seattle, Wash.
2DX Radio Club, Charles Baronofsky, 92 Newport Ave., Brooklyn, N. Y.
J. E. Grove, 646 Market St., Wheeling, W. Va. (Builds sets.)
Elbert Janes, 1119 East 14th St., Davenport, Iowa.
William Moulton, Box 172, R. F. D., Acushnet Station, Mass.
Jack A. Smith, P. O. Box 445, Deleon, Texas.
Paul Weber, 1339 DeKalb Ave., Brooklyn, N. Y. (Builds sets of standard parts.)
F. F. Loder, 1621 Rice Ave., Corning, Tehama Co., Calif.
William Shoncite, 163 East 42nd St., New York City.
L. Hamilton Adams, Jr., 10 Roosevelt St., Norwalk, Conn.
S. Zelony, 60 East 109th Street., New York City. (Builds sets and buys parts in quantity.)
Riverside Radio Club, 646 West Ninth Street, Room 6, Virginia Block, Riverside, Cal.
Wesley Rumery, R. F. D. No. 1, Derby Line, Vt.
Payton Lewis, 3826 Dennison Place, N. W., Washington, D. C.
George McKee, Mallet Creek, O. (Radio salesman.)
Private Charles E. Ernst, D. & R. Cantonment, Fort Hamilton, Brooklyn, N. Y.
J. W. Kilgore, 1122 Third Street, Fort Madison, Ia.
F. W. Becker, 31 North Main Street, Gloversville, N. Y. (Dealer.)
Arthur F. Hansen, 227 South Main Street, Los Angeles, Cal.
Ing. A. Orsi, Via Due Macelli 60, Rome, Italy.
Robert Henry, 307 West Pine Street, Butler, Mo. (Retailer.)
P. Van Derzee, 70 Ruggles Street, Roxbury, Mass. (Will establish a radio business in early fall.)
John W. Hoke, 214 Cottage Street, New Castle, Pa.
B. L. Thomas, 74 McCormick Street, Clifton Forge, Va.
C. L. Storer, 127 South Eleventh Street, Lincoln, Neb. (D. E. Moore, manager, Radio Department.)
J. L. Manson, Jr., Prairie Home, Mo.
B. S. Williams, Woodston, Kan. (Dealer.)
R. I. Pennell, care George Hall, Hebron, Neb.
Private George C. Olsen, Company "H," Second Infantry, Camp Custis, Michigan.
F. Throcheski, 2145 Alumni Place, Dubuque, Ia.
T. Haupert, 809 Seminary Street, Dubuque, Ia.
A. C. Greenbaum, 5036 Michigan Avenue, Chicago, Ill.
Robert G. Youngren, 5445 South Wells Street, Chicago, Ill.
John Remmers, Oskaloosa, Kan.
J. C. Roper, 5325 Bond Street, Oakland, Cal.
R.-B. Battery & Electric Service Station, Galva, Ill. (Wholesale and retail.)
Frank S. Harris, Sacandaga, N. Y.
L. I. McBrien, R. 3, McCook, Neb. (Consumer.)
A. W. Lindstrom, 14 East Main Street, Torrington, Conn. (Interested in used sets.)
F. V. Healy, 116 South Pearl Street, Joplin, Mo.
G. E. Shutt, City Garage, Fayetteville, Ark.

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for $1.00 Radio World, 1493 Broadway, N. Y.

New Radio and Electric Firms

Scotia Electric and Manufacturing Co., Scotia, N. Y., light and power plants, $5,000; J. Steinbach, W. N. Vandeberg, A. C. Neilson. (Attorney, J. H. Gould, Schenectady.)

G. Sommers & Co., St. Paul, Minn., will add a radio department. The buyer is J. A. Dieber.

Consolidated Hydro-Electric Corp., Dover, Del., manufacture motors, $100,000. (U. S. Corporation Co.)

Audio Laboratories, New York City, radio manufacturing, $5,000; V. Himmer, Jr., C. Bosworth, M. Didshun. (Attorney, S. Sprung, 291 Broadway.)

S. S. S. Radio, New York City, make parts, $20,000; M. Schier, N. Jurgrau. (Attorney, H. S. Cantor, 280 Broadway.)

Magnus Electric Co., New York City, has increased its capital stock from $100,000 to $250,000.

Radio Stores Corp., New York City, has increased the number of shares from 1,000 common, no par value, to 500 preferred, $100 each, and 1,000 shares, no par value.

Chelsea Electric Corp., New York City, $10,000; B. V. Price, J. Ort, H. Reikes. (Attorney, M. Ornstein, 147 Fourth Avenue.)

E. L. Electric Welding Repair Co., Brooklyn, N. Y., $10,000 to $20,000.

Public Electrical Supply House, New York City, $10,000; N. J. and J. and A. Feinberg. (Attorney, B. Kronenberg, 302 Broadway.)

American Manufacturers, Go After the English Trade

AN authoritative announcement reaches RADIO WORLD to the effect that the number of radio fans is increasing at the rate of fifteen hundred a week in England.

At that rate there would be an increase of about eighty thousand radio fans in England during the coming year. Due to the fact that the ratio of increase becomes greater with each new thousand it can readily be seen that England offers a fine market for the right kind of radio goods.

The suggestion is hereby made that manufacturers and distributors of American radio goods should investigate the new conditions in the English market and guide their business activities accordingly.

A New Radio Booklet

"SIMPLICITY OF RADIO" is the title of a booklet by Powel Crosley, Jr., published by the Crosley Manufacturing Company, Cincinnati, Ohio. The booklet is well illustrated and contains considerable interesting radio information, more especially referring to Crosley apparatus.

Rova Now Operates Four Radio Stores

IN the Hotel Claridge, Forty-fourth street and Broadway, New York City, a fourth Rova radio store has been opened. This store, formerly operated by Radio Reynolds, is in the heart of the theatrical district, and will cater to uptown trade.

Public Broadcasting Station Proposed for Philadelphia

ERECTION of a central radio broadcasting station, to be owned and operated publicly as one of a chain which will extend throughout the country, is asked by representatives of the National Radio Chamber of Commerce in a proposal laid before the Philadelphia Chamber of Commerce. Dr. Wilmer Krusen, chairman of the Municipal Affairs Committee of the Philadelphia Chamber, has the proposal under consideration.

The National Chamber is quoted as saying:

"The public broadcasting station must, and will, be supported by the people whom it serves. We are presenting to Philadelphia the opportunity to lead the way in the great, new development of this epoch-making art by establishing the first public broadcasting station in the United States, owned and operated by the public."

Argentina Radio Manufacturer Bankrupt

THE largest manufacturer of radio telephone and telegraph apparatus in Argentina has applied for a receivership, according to advices reaching the Department of Commerce. The financial difficulties of this company are due, it is said, to intense competition existing in the Argentine market, which resulted in considerable price cutting.

Hartzell Opens Syracuse Office

THE Hartzell Sales Company announce the opening of a branch office in Syracuse, N. Y., to be in charge of Arthur C. Smith as branch manager. The temporary address will be 1615 West Genesee street. This office will cover all of the New York State territory with the exception of Greater New York and a radius of fifty miles therefrom.

Westinghouse Suit Against De Forest in Court

THE Westinghouse Electric & Manufacturing Company began legal action last week in New Jersey against the Radio-Craft Company, Inc., and De Forest Telephone & Telegraph Company. The Westinghouse company claims the defendants are infringing on the Armstrong patent, which it controls.

Modell's Seventh Store Is Opened

MODELL'S, the well-known radio supply house, opened its seventh New York City store last week at 140 West Thirty-second street. By the autumn of this year it is expected that Modell's will be operating twelve high-class radio stores in the metropolitan district.

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Standardizing Radio Equipment

By S. Herbert Mapes

ALL radio fans will remember the condition of affairs a year ago. At that time there were all kinds of fraudulent and freakish sets and parts—poor merchandise in every way—so that legitimate and reliable radio apparatus was hardly able to gain a foothold in the market.

The first step taken to bring order out of chaos was by the Federal Telephone & Telegraph Company, which started to standardize their receiving sets and parts, and guarantee every product that left their factory, in this way establishing the confidence of the public and placing radio in its true position in the field of legitimate merchandise.

This move, made by a manufacturer who has been producing quality apparatus for the past twenty-two years, will be a great help to the uniformed layman because he knows nothing about radio, and if he knows he can purchase a radio set with a guarantee from a manufacturer who is a veteran at the game then it is up to him to settle in his own mind that he wants the best and with a guarantee.

The uninformed layman who selects and purchases instruments for his radio receiver is about as likely to make a wise choice, as Edgar Felix so truly says, "as a Hindoo attempting to fit out an Arctic expedition."

He is offered the choice of an extensive line of material, each piece of which seems to have certain technical merit, and if he does not know just what to buy he is lost in a maze of indecision.

The answer to the layman's general question, "What kind of sets should I buy?" may best be answered by a consideration of what he wants his set to do—the service he expects from it.

How loud a signal does the owner want? If he can pay the price he can receive music from a broadcasting station more than a thousand miles distant and make it audible for a block or two from his house. On the other hand, he may be told that a certain station can be heard at a certain distance with a particular set, yet that signal may be so weak that it will be drowned out by the ticking of a watch.

If the buyer is content with a pair of ear phones on his head then signal strength obtained on a crystal set or vacuum tube detector will be sufficient.

But if he wants to dance to radiophone music, or if he wants to make concerts audible to as many persons as he can accommodate in a room, apparatus will be needed which produces much greater signal energy. This must be sufficient to operate a loud-speaking horn, and, except for short distances, an amplifier is necessary.

If money enough is available amplification can be provided so that a signal can be amplified to practically any degree of strength.

The type of receiver essential to obtain signals of sufficient loudness for head telephones, and the type for operating loud-speakers for various distances from the transmitting station, is, of course, something that must be determined. Every layman is confronted with questions such as these when he starts out to select his equipment. Should he spend $20.00 or $300? Should he choose a crystal set or a tube set? Should he buy head phones or a loud-speaker? What facilities has he for putting up an antenna, and what kind of antenna should he have? These are questions which the layman must decide before he makes his purchase.

During the year just passed great improvement has resulted in radio apparatus and its usefulness. Transmitters and receivers have been greatly improved, with the result that greater public interest has been stimulated. Perhaps in no other line of endeavor has there been more activity and progress through improvement of apparatus than in radio.

The primary thing to do now is for all those interested in radio to maintain the high standard of technical requirements and ask for standard, guaranteed radio products, such as the Federal Telephone & Telegraph Company manufacture.

Who Will Give This Sick Man a Radio Set?

EDITOR, RADIO WORLD: Being dependent upon an aged father for support and physically handicapped through paralysis and tuberculosis, unable to work, or enjoy life as I see others all about me enjoying it, I am led to make this appeal to you. Would you or some of your readers be willing to donate to me a radio outfit—nothing elaborate, but a simple set that I could operate successfully here in the mountains? I assure you it would bring new joys and thrills into the life of me, to whom many of the good things that others enjoy are but a dream. I sincerely thank you for any favors you deem advisable to grant me.

Sincerely yours,

36 Broadway, CHARLEY BARRETT.
Saranac Lake, N. Y.

Manufacturers, Please Oblige!

EDITOR, RADIO WORLD: Several manufacturers have not answered my inquiries for literature in other publications, and would therefore like to have you place my name with reliable concerns who wish to do business. Am in control of at least six sets and have constant use for high-grade material, but cannot learn their merits except through some understanding of their make-up.

5023 Baltimore Ave., R. J. RUSSELL.
West Philadelphia, Pa.

Calculating Inductance of Polygonal Coils

COILS wound on forms such that each turn incloses a regular polygon are finding frequent use in radio circuits. Not only are they easy to construct, but support for the wires of the coil is necessary only at the vertices of the polygon. Thus, the amount of dielectric near the wires is small, making it easy to reduce energy losses in the dielectric to a very small amount.

In Scientific Paper No. 468, "Formulas and Tables for the Calculation of the Inductance of Coils of Polygonal Form," published by the Bureau of Standards, Washington, D. C., formulas are derived for the calculation of the inductance of such coils. The cases treated are triangular, square, hexagonal, and octagonal coils. It is found that a circular coil inclosing the same area as the polygonal coil, the length and the number of turns being the same in both cases, has nearly the same inductance as the polygonal coil.

This suggests the presentation of the results in such a way as to enable the radius of the circular coil having the same inductance as the given polygonal coil to be found. Knowing this, the inductance of the polygonal coil can be found by existing formulas and tables applicable to circular coils.

The tables given show what is the equivalent radius of the polygonal coils which are likely to be met in practice. Other cases can be treated by a simple interpolation.

Coming Events

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

Test Case on Broadcasting Copyrighted Music

WHETHER the broadcasting by radio of a copyrighted musical composition constitutes an infringement of the copyright law will be threshed out in a friendly suit which M. Witmark & Sons, music publishers of New York City, will bring against the department store of L. Bamberger & Co., which operates Station WOR, Newark, N. J.

The alleged infringement occurred June 4, the song being "Mother Machree," rendered vocally. The defendants will admit they have been broadcasting copyrighted music without license, the suit being primarily for test case purposes.

J. C. Rosenthal, general manager of the American Society of Composers, Authors and Publishers, in an affidavit, sets forth he offered to license the Bamberger firm for $1,000 annually, which was refused.

Mexico City Has New Broadcasting Stations

TWO radio telephone broadcasting stations were recently opened in Mexico City, a report from Consul Thomas D. Bowman, Mexico City, states. Various efforts have been made in recent months to obtain concessions for the establishment of such stations, but it is only recently that the government granted this permission.

There appears to be great enthusiasm over local broadcasting and it is believed that the market for radio sets in Mexico is favorable to considerable development by American manufacturers.

Radio sets are now sold by electrical dealers, for the most part, although some American concerns have sent direct agents to promote sales. One dealer has estimated that approximately 150 high power sets have already been sold in Mexico City. It is reported that other broadcasting stations are to be erected in Mexico.

Latest Move in Broadcaster-Music Publisher Fight

THE National Association of Broadcasters, with offices at 1265 Broadway, New York City, under the direction of Paul B. Klugh, Executive Chairman, have followed up the announcement that no performing rights royalties will be paid to copyright owners with a country-wide appeal to song-writers and publishers to turn over their mechanical royalty money to the association.

In a circular sent to music men and writers the association declares that the broadcasting of tunes is a great publicity movement, will stimulate sales, and, in fact, makes quick hits, with the following of big returns for the publishers and writers from the sale of their songs.

The American Society of Composers, Authors and Publishers holds a contrary opinion. It asserts that broadcasting hurts music sales; that it is public performance for profit, and that royalties should be collected in the same manner as from the motion picture theatres, dance halls and cabarets.

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Religious Services From WMC Highly Appreciated *By George D. Hay*

HEARING a sermon for the first time in her life, after being born deaf, Mrs. J. C. Lockert of Jackson, Tenn., writes to WMC, The Commercial Appeal's radio station at Memphis, Tenn., through her husband, expressing deep appreciation of the revelation that has come to her through the medium of radio. Hundreds of cases have been reported throughout the country of deaf persons being made to hear the oral language through radio.

Following is part of Mr. Lockert's letter: "Wish to thank you for the excellent sermon by the Very Reverend I. H. Noe, dean of St. Mary's Cathedral in Memphis, which came in today through a loud speaker with such distinctiveness that it was heard throughout an eight-room dwelling and was also heard by neighbors across the street.

"In this connection I would like to say that my wife, who was born deaf, heard this, her first sermon in the oral language, by the use of ear phones. Please extend the Reverend Noe and his splendid choir our appreciation, etc."

Since WMC began broadcasting Dean Noe's sermons and the services at St. Mary's Church a month ago, hundreds of letters have been received from all over the country, expressing appreciation of the innovation.

An Episcopalian directly across the street, who had remained indoors on Sunday mornings was brought face to face with the church services through radio and forthwith decided to arise each Sunday and attend church. All of which proves that it is not a case of distance.

T. C. Scott and his family, of Leachville, Ark., are now holding open house on Sunday mornings, inviting people from miles around to take advantage of Dean Noe's sermons through their radio set.

The faculty and Normal School students of the State Agricultural College at Jonesboro, Ark., hold a "relay" service each Sunday in the school auditorium, where over 200 persons gather for the sermon.

Mrs. Aaron Allen, of Memphis, who has been confined to her room for eight years with a serious illness, heard her first sermon since she was stricken when her radio set caught St. Mary's choir and the dean's sermon.

John Myers, a world War Veteran, who has been paralyzed for four years, was also the recipient of the spiritual message.

Mrs. H. H. Cruse of Houston, Tex., reports that her little daughter, Thelma, insisted upon wearing the receiver throughout the service, to fall peacefully asleep at its close.

Dr. J. H. Lockey of Ripley, Tenn., writes that his wife could not attend her own church on account of illness, and was given the entire service from St. Mary's over the radio. C. V. Hunter of Kennett, Mo., reports that he entertains a large number in his home every Sunday with radio and WMC's service.

WMC could go on indefinitely relating instances that are reported each day, as a result of its Sunday service, through the courtesy of Dean Noe.

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it. Buy your "B" Batteries direct from Manufacturer. No old stock batteries, but fresh tested batteries, with a 100 per cent. efficiency, at the following low prices, which are 50% less than list price.

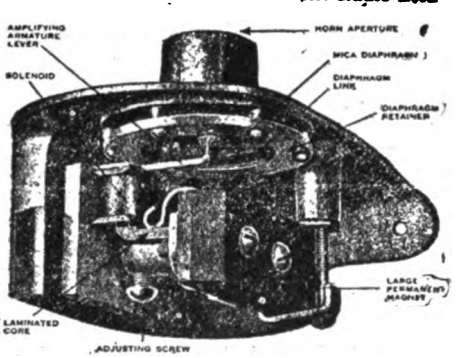
	Large	Medium	Small
22½ Volt plain	$1.25	$1.00	$0.70
22½ Volt variable	$1.38	$1.13	$0.75
45 Volt plain	$2.50	$1.75	—
45 Volt variable	$2.75	$2.00	—

Any other type of battery made to order. Send Money Order or Order for C.O.D.

ROSENDAL & CO., 2 Stone Street, New York

The Trinity Loud Speaker

The only device of its kind in the Radio field



Type "B" $12.50

TYPE "A1"
$25.00
21-in. Fiber Horn

Study the illustration carefully and you will understand why it produces full, clear, natural tones with perfect reproduction of all vocal and instrumental music. May be used with phonograph. No storage battery required.

The Trinity Loud Speaker is an instrument that combines the best qualities of a phonograph reproducer in combination with electro magnetic principles best fitted for radio amplification. Absolutely perfect reproduction of all music and speech without distortion. The volume may be regulated from that required for a room in your home to a tremendous output that can be heard hundreds of feet out of doors by simply increasing "B" battery voltage. No storage batteries required. The instrument is of a heavy duty type and is guaranteed fully by the manufacturers.

Ask your dealer for demonstration—if he cannot we can.

TRINITY RADIO CORP.

168-"B" DARTMOUTH STREET BOSTON, MASS.

SPECIAL VACATION SUBSCRIPTION OFFER
(FOR NEW SUBSCRIBERS ONLY)

In order to materially increase our subscription list we are offering for a limited time a special subscription of seven issues of Radio World for $1.00. You may begin your subscription now, or have us start sending the first issue on this subscription offer when you go out of town.

CUT OUT THIS TODAY SO THAT YOU WILL NOT FORGET ABOUT IT

Radio World's Special Summer Subscription Offer

Radio World, 1493 Broadway,
New York City

Enclosed find $1.00, for which send me Radio World for seven issues, beginning with your number dated.....

SUBSCRIPTION RATES

Single Copy	$ .15
One Year (52 numbers)	6.00
Six Months	3.00
Three Months	1.50

Add $1.00 a year for foreign postage. 50 cents extra yearly to Canada.

Name.....
Address.....
City and State.....

Two Good Reasons for Suspending Amateur Licenses

RECENTLY the license of an amateur operator was suspended by the Department of Commerce for a period of three months on account of the operator being examined within three months after a prior examination in which he failed to pass, which constituted a violation of regulation 133 of the Radio Communication Laws of the United States, which reads, in part, as follows: "No applicant who fails to qualify will be re-examined at any examining office within three months from date of the previous examination. . . . When the records of the bureau develop the fact that an applicant has failed to qualify and has applied for re-examination or been re-examined at the same or another office within three months his existing license may be suspended or revoked by the Secretary of Commerce."

In another case an amateur operator had his operator's license and station license suspended for one year for violation of Section 7 of the Act of August 13, 1912, in that he transmitted a false distress signal (SOS).

Summer Hotel Stuff

"This room is small and seems poorly furnished—one chair and a folding bed."

"That, sir, is the telephone booth."—*Louisville Courier-Journal.*

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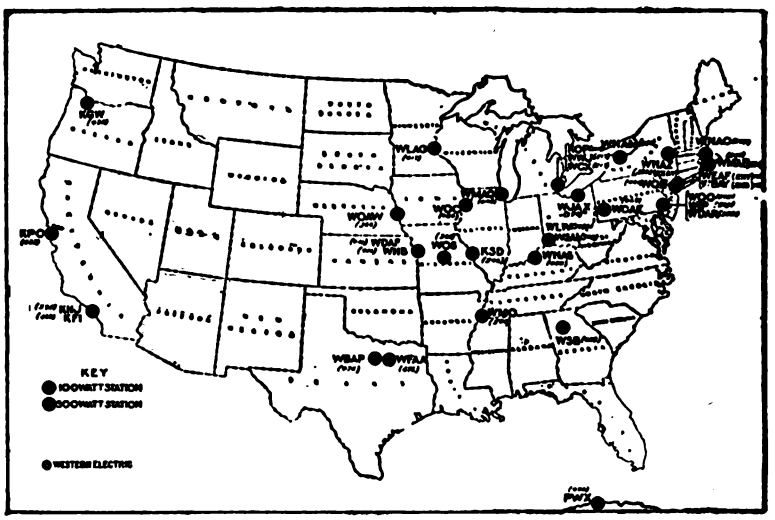
Old Friends with New Wave Lengths

The map herewith visualizes a number of stations well known to distance listeners, which are now operating on the new wave lengths. All are equipped with 500-watt Western Electric transmitters, except WHAM and WNAC which deliver 100 watts; station WMAF has both 500 watt and 100 watt transmitters. The stations shown on the map, with their new wave lengths, are as follows:

Call Signal	Station Name	Wave Length
KFI	Examiner—Earl C. Anthony, Los Angeles, Calif.	469
KGW	Oregonian Publishing Co., Portland, Ore.	492
KHJ	Times-Mirror, Los Angeles, Calif.	395
KOP	Police Department, Detroit, Mich.	360
KPO	Hale Brothers, San Francisco, Calif.	423
KSD	Post Dispatch, St. Louis, Mo.	546
PWX	Cuban Telephone Co., Havana, Cuba	400
WBAP	Star Telegram, Fort Worth, Texas	475
WBAY-2XB	Western Electric Co., Inc., New York City	492
WCAE	Kaufman & Baer Co., & Pittsburgh Press, Pittsburgh, Pa.	469
WCX	Free Press, Detroit, Mich.	517
WDAF	Star, Kansas City, Mo.	411
WDAR	Lit Bros., Philadelphia, Pa.	395
WEAF-2XY	American Telephone & Telegraph Co., New York City	492
WFAA	News, Dallas, Texas	476
WHAM	Eastman School of Music and Democrat & Chronicle, Rochester, N. Y.	360
WHAS	Courier Journal, Louisville, Ky.	400
WHAZ-2XAY	Rensselaer Polytechnic Institute, Troy, N. Y.	380
WHB	Sweeney Automobile School, Kansas City, Mo.	411
WIP	Gimbel Brothers, Philadelphia, Pa.	509
WJAX	Union Trust Co., Cleveland, Ohio	390
WKAQ	Radio Corporation of Porto Rico, San Juan, Porto Rico	360
WLAG	Cutting & Washington Radio Corp., Minneapolis, Minn.	417
WLW	Crosley Mfg. Co., Cincinnati, Ohio	309



Map Showing Location of Well-Known Stations With New Wave Lengths.

WMAF-1XV	Round Hills Radio Corp., So. Dartmouth, Mass.	360
WMAQ	The Fair Corp., & Chicago Daily News, Chicago, Ill.	448
WMC	Commercial Appeal, Memphis, Tenn.	500
WNAC	Shepard Stores, Boston, Mass.	278
WOAW	Sovereign Camp, Woodmen of the World, Omaha, Neb.	360
WOC	Palmer School of Chiropractic, Davenport, Iowa	484
WOO	John Wanamaker, Philadelphia, Pa.	509
WOR	L. Bamberger & Co., Newark, N. J.	405
WOS	Missouri State Marketing Bureau, Jefferson City, Mo.	360
WSAI	U. S. Playing Card Co., Cincinnati, Ohio	309
WSB	Journal, Atlanta, Ga.	429
WWJ	News, Detroit, Mich.	517

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Series, Parallel, Direct-Ground

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dial-mounted

Enables you to receive long waves in the parallel position; short waves in the series position; and waves of medium length by eliminating the condenser entirely. Instructions for mounting and for wire connections given with each instrument.

List Price $1.25

Attractive discounts for dealers and jobbers. Write for descriptive circular.

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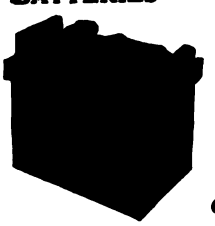

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6 Volt 80 Amps.	12.50
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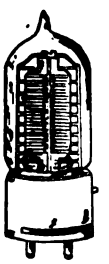

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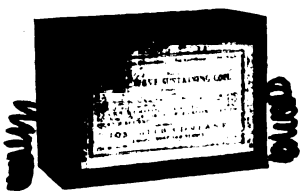

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

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This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

TWO FOR THE PRICE OF ONE—Send $3.00 now for six months' subscription (26 numbers) for Radio World during the coming month and we will send you also Popular Radio or Wireless Age or Radio for six months without any extra charge. Or send $6.00 now and we will send you Radio World for one year (52 numbers) and Popular Radio, or Wireless Age or Radio for one year. These offers not good after July 23, 1923. If you are already a subscriber you can take advantage of this offer by renewing from the end of your present subscription. Sub. Department, RADIO WORLD, 1493 Broadway, New York City.

AGENTS, crew managers, $20 daily distributing bamboo self-filling fountain pens; imported; something new; everybody going wild; sample free. SPORS CO., Lesueur Center, Minn.

HONEY COMB COILS—35, 50 or 75 Turn, 40c, Each Mounted, $1.25; Special Windings to Order. Tapped Honey Combs, 3c per Tap. Crystals—Honest John's Old Fashioned Crystals. "Thunder Note" (Pyrites) and "Wonder Rock" (Galena). Tested, guaranteed and individually boxed. Each Crystal as big as a walnut. Biggest value in radio, 25c each. Small Pyrites or Galena Crystals for mounting, 75c per pound. Dealers and jobbers, write for special quotations. Factory agents wanted in some States. HONEST JOHN MFG. CO. (Dept. RW.), 1509 East 11th Street North, Portland, Ore.

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WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

SALE—Exide 120 hr. Battery, $12.50; Kellogg Sockets, 30c.; Transformers, $1.90. All kinds. Guaranteed apparatus at proportionate prices. KENNETH JONES, London Mills, Ill.

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Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

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SUPER-SIMPLICITY CIRCUIT—1,000 to 1,900 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

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Features of the Program from WGI, Medford Hillside, Mass.

Saturday, June 30, 1923

6:00 P. M.—New England Weather Forecast furnished by the U. S. Weather Bureau.
New England Crop Notes furnished by V. A. Saunders, Statistician.
Late News Flashes—Early Sports News—Boston American.

6:15 P. M.—Conditions of Massachusetts Highways furnished by the Automobile Legal Asso.
Amrad Bulletin Board.

6:45 P. M.—Code Practice, Lesson Number Sixty-Nine.

8:30 P. M.—Evening Program.
1. Thirteenth of a series of talks on New England Business Problems conducted by Arthur R. Curnick of the New England Business magazine.
2. Concert Program.

Sunday, July 1, 1923

4:00 P. M.—Twilight Program.
1. "Adventure Hours," conducted by the Youth's Companion.
2. Concert by Miss Miriam Stanley Carlton, Soprano and Violinist, accompanied by Miss Nellie Dean, Pianist.

8:30 P. M.—Fifth in a series of talks on World Unity by prominent New England speakers, conducted by the Massachusetts Federation of Churches.

9:00 P. M.—Musicale.

Sweden to Have Liberal Radio Laws

THE proposed Swedish law for regulating radio telephony in that country recognizes the principle of free competition with regard to the manufacture of radio apparatus. It will permit amateurs to build their own sets, requiring only that these shall be constructed in accordance with certain regulations, advices to the Department of Commerce from Assistant Trade Commissioner Sorensen state. The Telegraph Department does not contemplate limiting within narrow margins the wave lengths on which amateurs may receive.

In accordance with the proposed law the government is to erect the broadcasting stations and rent them to the Radio Telephony Company, which in turn will receive a rental from receiving stations.

No mention is made in the law regarding sending apparatus. The Telegraph Department will control receiving sets and supply them with a certain control mark, whereas the Radio Telephone Company will give permission to use such against payment of a license fee, 10 per cent of which reverts to the State for the control privilege.

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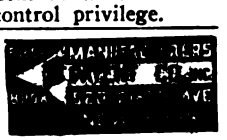

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GUARANTEED GENUINE
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Add 25c. Postage and Insurance

SUNBEAM QUALITY goods, to complete the COCKADAY CIRCUIT. One guaranteed, accurate set of coils consisting of one plain and one Bank-wound coil sent postpaid for.....$2.75

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AMATEURS! FANS! ATTENTION!

ALL BROADCASTING STATIONS—Complete with the call, location, wave length, frequency of the station, and power used started in Radio World of June 9.

This list is most complete, and no amateur or fan should be without it. It will be completed in following issues, and as revisions or changes are made the list will be kept up-to-date, so that you will always have an up-to-date list to which you can refer. Don't miss any issue. Send 15c to

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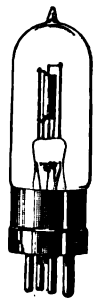
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With all the new allocations and changes recently brought out. Scale, 100 miles to the inch; in two colors—Size 34x28.
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32 Owen Building, Washington, D. C.
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Radio Waves to Fight Aircraft

German scientists were reported last week as having devised a method of putting out of commission any motor using electric ignition, by stopping its magneto with radio waves. The Los Angeles *Times* asserts that Southern California experts claim that they are able to outwit the German inventors. This is said to be possible in two ways. While the German use of radio waves of unusual potency will undoubtedly put many types of internal combustion motors out of action, other forms have been developed which can not be so affected. The *Times* goes on to say:

The success of the Siemens-Stinnes experts in Germany may stimulate especially American use of the steam turbine engine for aircraft, according to local airplane motor experts. This type, and the heavy-oil burning engine, such as the Diesel, will not be touched by the German development.

The turbine has already been developed for actual use in airplanes. Harry Peters of La Crescenta, widely known aviation motor expert of England, whose health sent him to Southern California after the war, made flights in a turbine-equipped airplane before leaving England.

A turbine engine for airplanes and automobiles has been developed at San Diego by John T. Waugh and Capt. B. H. Taylor, and, according to local airplane experts who have witnessed its operation, it works successfully, and has a much lighter weight per horse-power than the aircraft gasoline engine.

E. M. Fisk and R. S. Gradle, officers of the Commercial Aircraft Association, believe that engines burning heavy oil can be made feasible for aircraft, and that these will be made in America in the near future.

"The method reported in the *Times* cablegram has been suspected as having been developed for some time," said Bennett Harrison, of the Radio Service Company's staff. "It is feasible, for it puts the magneto out of commission and so stops any motor with electric ignition. It is surprising that the Germans conducted their experiments where the French investigators could learn of them, for their efficiency is now greatly affected.

"Experts of all nations will begin to search for means of counteracting the radio attack by developing motors which will not be subject to radio. France and England, whose main defense in future must be aircraft, are either forced to develop defensive radio control or scrap a great amount of their newly built equipment in engines.

"Radio control and interference will be enormous factors if we have another war. The influence of radio will be everywhere. Great stations like KHJ of the *Times* will have a great patriotic part, for they will reach millions on the instant and arouse and organize as was not possible in the campaigns of the past war. They will also warn an enemy of the temper of the American people.

"These stations should be considered by the Government as actually being powerful aids to defense and methods developed to protect them against any aerial interference in case of war. If possible, an enemy will cut them off from the air as surely as he would cut a cable. The possibilities of this are suggested by the report from Paris on the radio interference with aircraft motors."

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Dealers write today for our interesting proposition.
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Do You Want to Change Your Transmitter or Are You Planning to Build One?
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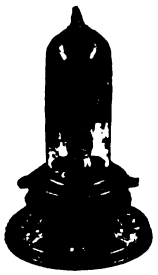

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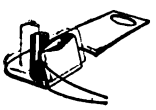

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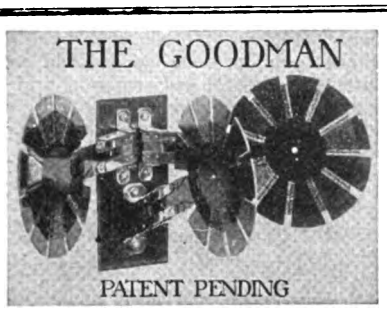

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RADIO WORLD

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THE United States Civil Service Commission announces an open competitive examination for laboratory assistant, senior grade.

The examination will be held throughout the country on September 5 and 6. It is to fill vacancies in the Bureau of Standards, Department of Commerce, at entrance salaries ranging from $1,200 to $1,380 a year, plus the increase of $20 a month granted by Congress, and vacancies in positions requiring similar qualifications.

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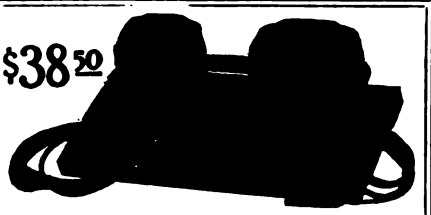
Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of U. S. Civil Service Examiners at the post



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Government Tests of Radio Receiving Sets

DURING the past two years the radio laboratory of the Bureau of Standards has been developing methods of testing radio receiving sets, and has made tests on receiving sets of a number of different types. The results of the tests on these sets are given in a series of letter circulars which are in preparation. The first letter circular in this series is designated as Letter Circular 90, and has recently been issued. The sets on which tests are therein described are regenerative sets using electron-tube detectors and are of the type intended for such use as the reception of continuous wave signals from arc transmitting stations on wave frequencies down to 60 kilocycles (wave lengths up to 5,000 meters).

The Bureau of Agricultural Economics, U. S. Department of Agriculture, on account of its interest in the reception of crop, market and weather reports by radio, has assisted in this investigation. The particular receiving sets studied are referred to by arbitrary reference numbers rather than by a statement of the manufacturers' names and type or model numbers. It is believed that the methods followed and the examples given in this circular will be of assistance to manufacturers in the development of methods of testing and describing their own products, and thus improving them. It is believed that purchasers will also be directly aided in deciding what features and characteristics to look for in the selection of apparatus.

A limited number of mimeographed copies of Letter Circular 90 are available, and can be secured by those who are directly concerned with the testing of receiving sets by addressing the Bureau of Standards, Department of Commerce, Washington, D. C.

Measuring Properties of Electrical Insulating Materials

THE Bureau of Standards at Washington, D. C., states that it receives frequent requests for information on the methods which it has found practicable for making measurements of properties of electrical insulating materials. The methods are described in Scientific Paper No. 471, "Methods of Measurement of Properties of Electrical Insulating Materials."

In Technologic Paper No. 216, "Properties of Electrical Insulating Materials of the Laminated, Phenol-Methylene Type," the authors have indicated the reasons for selecting certain of the physical properties for measurement in a research on electrical insulating materials. The same considerations apply in the measurement of many types of insulating materials besides the laminated phenolic materials. The information obtained by making measurements for a given material on all these properties is quite comprehensive. The properties for which methods of measurement are given are: Phase difference and dielectric constant at radio frequencies, voltage effects at radio frequencies, volume resistivity, surface resistivity, density, moisture absorption, tensile strength, transverse strength, hardness, impact strength, permanent distortion, machining qualities, thermal expansivity, and effects of chemicals.

¶ "Radio," the San Francisco magazine, is a very excellent publication. We have made arrangements with the publishers by which we are able to offer for a limited time only a six months' subscription for RADIO WORLD at the regular price of $3.00 and also "Radio" for six months without extra cost.

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Yours truly,
KENNETH H. JONES.
London Mills, Illinois.

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Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.

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What Makes Radio Possible, by Edward Linwood.
Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.

APRIL 29.

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My Practical V. T. Detector and Two-Stage Amplifier, by Frederick J. Rumford.
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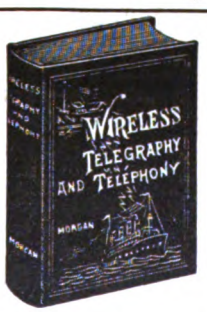

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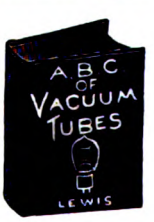

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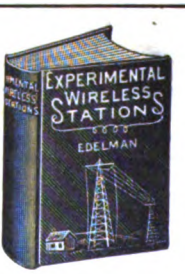

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Another Appreciative Subscriber Heard From

Editor RADIO WORLD: In your April 14th issue there appeared an interesting article by Arthur S. Gordon entitled "Build Me," giving details for a very clever set.

At the time this issue came out I was in the throes of construction, being at work upon a two variometer set. I had my variocoupler, inductance switch and condenser all in and was about ready to purchase the variometers when along came your article and changed everything. I read the article very carefully and while I could not follow the exact instrument placings I could follow the hook up. So I built the set and it's a wonder! I used a Pioneer coupler, Walnart 43 condenser back panel inductance, Acme transformer cartridge grid condenser and leaks in triple mount, wiring two grid mounts in series giving me a variance of grid from one to five by using several grid cartridges of different values.

I have a beautiful set in golden oak cabinet carefully wired and it has been admired for beauty of finish by all who have seen it. And it works beautifully sweet and clear.

Before I had an aerial up I hooked it to the bed springs. One night got Memphis WMC, another night WHB Kansas City and another night WOAY Birmingham, all on the bed springs. I have just put up an aerial and through a bank of static that has camped around here with the present heat wave I enjoyed San Antonio WOAI Sunday evening concert clear as a bell. So all in all this answers your query on page 6 of April 14 issue: "Why do you read RADIO WORLD?"

I believe the fundamental desire of the public generally is to be enlightened upon the intricacies of radio; to have their small knowledge of the art given food upon which to develop a better understanding of it. This RADIO WORLD is doing. I see every issue. It is only deserving that it should be as popular as it is.

W. RITT CHANDLER.
Box 716, Clarksdale, Miss.

Broadcasting Popularizes at Least One Song

In an article on radio and the music industry written for *The Music Trades*, E. F. McDonald, Jr., of the Chicago Radio Laboratory, quotes this interesting incident:

A typical example of the effect of broadcasting on vocal music was furnished by the testimony volunteered at the first meeting of the National Association of Broadcasters when Mr. Wendell Hall, a song writer, made the declaration that "Mellow Moon," which he had written, made no appreciable headway in the hands of a publisher who resorted to the usual avenues open to publishers for exploiting a new musical creation. There was practically no sale. Then Mr. Hall began singing "Mellow Moon" at KYW and WDAP broadcasting stations. He stated that in the month of April the sale of "Mellow Moon" jumped to 100,000.

Making the Set Was Easy!

LITTLE JOE had completed his crystal receiving set and had made it "work." His astonished and proud mother said to him:

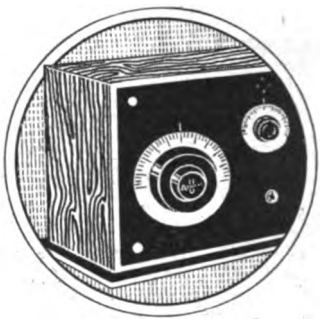
"Wasn't it very hard to do all this?"

"Naw," said Joe; "most of it was easy as anything."

"What was the hardest part of it?" she asked.

"Gettin' eight plunks out of pa," said

Ice—Exchange



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Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

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IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

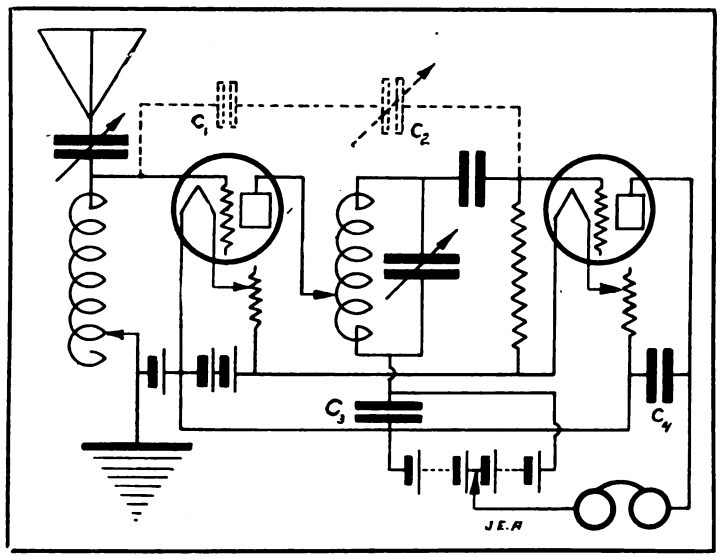
Vol. III, No. 15. Whole No. 67 **July 7, 1923** **15c. per copy, $6.00 a year**

The Nite Owl Special

By J. E. Anderson, M.A.

IF you are in pursuit of the elusive DX signals that nightly fill the ether, you are also in pursuit of new circuits with which to bag your game; and here is one which undoubtedly will interest you. It will coax the signals from the farthest recesses of the ether and literally hurl them against your ear drums, and you don't have to guess what call letters were used as missiles either. But the circuit is somewhat difficult to manipulate at first and is likely to become a storm center in the neighborhood until the operator has learned to obtain maximum signal strength without generating a lot of "birdies." With a little practice it is possible to tune it in on almost any signal and bring it to the very brink of oscillation without once letting it "spill over."

The new feature of this circuit lies in the interstage coupling which was first suggested to me by Mr. W. A. Marrison, of the Western Electric Company, who has obtained remarkable DX results with a circuit similar to the one described here. Using this type of coupling between two stages of radio-frequency amplification and between the second stage and a tuned crystal detector, he picked up stations 1,500 miles away on a very small indoor antenna, and the circuit was extremely selective. The present circuit is not nearly so selective, but it is easier to manipulate and not nearly so critical. There are several means by which the regeneration may be easily controlled.



Circuit diagram of receiver utilizing super-tuned radio-frequency. The neutralizing capacities are optional, but will aid in reception if used.

A glance at the accompanying diagram will show that the circuit consists of one stage of radio-frequency amplification and a detector and that the two tubes are coupled by a tuned auto-transformer. Thus the plate circuit of the first tube is tuned and this makes the first stage regenerative. The reaction between the plate circuit and the grid of this tube may be regulated by varying the amount of inductance in the plate circuit. For this purpose the interstage inductance coil is tapped at about every five turns and the plate lead of the first tube tied to one of these taps. Maximum reaction is obtained when the plate is tied to the upper end of the coil and minimum reaction when it is connected to the lower end. As the reaction is reduced the coupling between the two tubes is also reduced, but at the same time the ratio of transformation is increased. The plate potential of the first tube is supplied through the windings of the interstage inductance coil and hence the grid condenser of the detector tube serves the double function of blocking the grid current of detector and preventing the plate potential of the first tube from reaching the grid of the second. Therefore the insulation of this condenser should be of the highest order. The grid leak resistance of the detector is connected directly from the grid to the positive side of the filament. The values of these two elements do not differ from those used in other circuits. The condenser C_3 is a by-pass across the "B" battery and serves the usual purpose of furnishing a low impedance path for the high frequency currents. Its value should not be less than .005 mfd. Condenser C_4 serves a similar purpose for the detector tube, but its value needs to be not greater than .001 mfd. The detector tube, as shown in the drawing is not regenerative but if desired it may be made so by one of the usual methods. If this is done the first tube should be operated at a point considerably below regeneration, or the circuit will be entirely unmanageable.

The two inductance coils in this circuit should be somewhat larger than is customary in order to obtain regeneration on the longer broadcasting wave lengths. From 60 to 75 turns on a 3.5 inch tube is about the minimum for the antenna coil and 60 turns on the same size tube for the interstage coil. The antenna coil should be tapped so that it may be varied in steps of from two to five turns and the interstage coil in steps of five turns.

These large coils require small condensers. Twenty-three plate condensers may be used but 11-plates are better. It will be found that signals come in loudest when small values of capacity and large values of inductance are used and the smaller condensers will give the necessary fine variation in tuning. This com-

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Studying Radio Code While Asleep

By Carl H. Butman

WASHINGTON, D. C.—Studying radio code while asleep may be the boon many amateurs are awaiting to insure a higher rate of reception. In any event, this method of instruction has been tried in the Naval Air Station at Pensacola with the result that backward students have improved their speed.

Due to the fact that many of the embryo aviators, who receive their radio instruction at the Pensacola Naval Air Station, have been unable to copy at a rate of twenty words a minute, the novel method of continuing to send to them while they are asleep, with their receivers in place, has improved their speed when awake.

The method, which was devised by Chief Radio Mate Phinney, in charge of radio instruction, gives every indication of becoming practical and valuable, naval radio experts believe, although some of them want to observe personally its application.

Chief Phinney, who is a student of the old school and served in the war as a commissioned officer, claims that the plan will aid in teaching students high-speed reception while asleep, increasing their facility in receiving in a fraction of the time ordinarily required in wakeful hours. Several students who were in danger of flunking their radio have been saved that ignominy, he claims, by instruction while they slept in their "ear-muffs." Subconsciously they continued to listen-in. The inventor conceived the idea of subconscious instruction following a personal experience. While practicing receiving at a rate of thirty-five words a minute, he feel asleep, but the mechanical transmitter continued to send to him. When he awoke, he declared he was able to receive at the thirty-five word rate, although previously he could only copy at twenty and twenty-five. His theory is that during his few hours of slumber his sub-conscious mind was trained to receive at the higher speed.

Skepticism greeted his early proposals of sleep instruction, but now even the skeptics admit the plan is workable. Requirements in the radio section of the flying school provide that within six months students acquire a speed of twenty words per minute before they can become pilots. This is a bugbear to many. In the last class several students proved difficult subjects and as a last resort the new method was tried to boost their speed.

Before they turned in, these students adjusted their head receivers and soon after "taps," an expert operator began to send at a rate of about ten words in excess of their capacity to receive. All through the night the messages in code went on, the operator at the key being relieved from time to time. In their conscious hours the following day, most of the students were able to receive messages at the speed sent to them while they slept.

Here is an opportunity for amateurs to improve their speed by picking up some naval ship or station sending code at night and sleeping with their "ears to the air" as it were. Many amateurs, as well as commercial operators, have experienced the aggravating continuation of the "dit-da-da" long after they have ceased to listen in, following a long session of receiving. This is practically the reverse of the method proposed, in that it is the continued operation of the subconscious mind and ear, which have adapted themselves to a code speed, although the messages have ceased. Some amateurs plan to try the method, as they all find a maximum speed point in reception which they are unable to pass for some time.

(*Concluded from preceding page*)

bination renders the circuit less selective than it would be if large condensers and small inductances were used, and for this reason only the very best condensers should be used and special precautions should be taken to select coils that have a low distributed capacity and low effective resistance.

This circuit is liable to raise a veritable bedlam of noises while tuning it unless this is very carefully done. To tune the circuit to any wave length within its range use as small values of inductance as possible both in the antenna and the plate of the first tube, and vary both the variable condensers until both circuits are in exact resonance with the desired wave length. If it starts to oscillate reduce the inductance some more and tune again. When both circuits are in tune the strength of the signal may be increased by gradually increasing the inductance in the antenna or plate circuits and retuning. A variation in the plate inductance of the first tube will have little effect on the tuning of the interstage coil as will be seen from the connection in the drawing. Two taps will soon be found on either coil such that the circuit will oscillate on one while it will not on the tap just below. If the signal is satisfactorily loud on the tap on which it will not oscillate this should be used, otherwise the first tap on which it will oscillate should be used. The oscillations may then be stopped by detuning one of the circuits slightly.

A third method of controlling the regeneration is suggested by the dotted lines in the drawing. Since the neutrodyne principle is a means of neutralizing the cause of regeneration in a circuit of this nature, it is evident that it may also be used to control the amount of regeneration. This may be done by inserting a small neutrodyne condenser between the two grids of the circuit and varying its capacity over the necessary range. This condenser must be very small and it must be capable of very fine variation in capacity. The finest variation in capacity may be obtained by connecting a small fixed condenser in series with a large variable one. In my experimental circuit C_2 was a variable 23-plate air condenser, but an 11-plate or a 3-plate will do equally well. C_1 was made by twisting together the ends of two pieces of No. 22 double silk covered wire. One to three turns were found to be sufficient.

If greater selectivity than this circuit will give is desired a double circuit tuner may be used in the first stage. But this circuit is extremely difficult to manipulate owing to its critical nature. However, it may be controlled in a similar manner to the single circuit tuner discussed above. It may further be stabilized by keeping the antenna circuit accurately in tune with the secondary and the interstage coils and by increasing the coupling between the antenna and the secondary. But these conditions, unfortunately, will cause greatest re-radiation and interference with neighboring sets when it does oscillate.

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Skyscrapers Absorb Radio Waves

By C. W. Tucker

ARE you in a dead spot? Quite a lot is being heard these days about dead spots. Baltimore cannot hear Washington radio stations. Pittsburgh radio stations are silent to Cleveland's ears. Yonkers hears New Jersey stations much better than New York City stations, although it is on the outskirts of the city.

An interesting study of this matter has been made by Bell System engineers in connection with the transmission from stations 2XY at 24 Walker Street, 2XB at 463 West Street and 2XW on the Municipal Building, New York City. As will be seen from the chart herewith there is a sharp decline in the strength of the radio fields of each of these stations in an almost direct northeasterly direction. The fields are very much weaker in an east and southeast direction, than they are on the west side. The line of the weakest field in the northeasterly direction is directly over a mass of skyscrapers in the Times Square district, while in the southeasterly direction, it leads over the skyscrapers in lower Manhattan and the eastern end of Brooklyn. For this reason, it has been assumed that the steel in these buildings absorbs the radio waves.

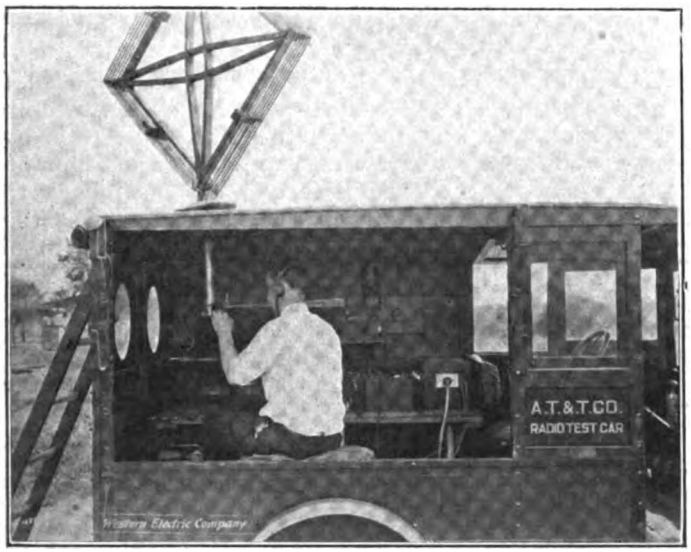

Fig. 1. Western Electric test car which recently made efforts to solve the problem of "dead spots" in radio reception around New York City.

This chart is really made up of two maps. The circle and the lines have no reference to distance but to the field strength of the broadcasting stations in microvolts per meter. The lines show the direction in which the readings were taken. The black dots represent the strength of the field in that particular direction. The lines connecting these dots do not represent the strength of field between the dots but are merely drawn in to show which station the dot represents.

Special measuring apparatus was developed in the Bell System Laboratories of the Western Electric Company for measuring the field strength of the different broadcasting stations. Essentially the process is one of measuring the current produced in a calibrated antenna by the incoming radio waves. Since these currents are very small they cannot be measured directly but a comparison method is necessary. An oscillator in the measuring set produces a small but measurable radio-frequency current, a very small part of which is picked off by a calibrated potentiometer and fed into the antenna. A receiving set also connected to the antenna is used as an indicator to tell when the currents produced in the antenna by the distant and local sources are equal.

Where the transmitting station is co-operating or under control, the distant and local signals may be introduced separately and alternately and their efforts on the receiving set compared by means of an indicating instrument attached to the output of the receiving set.

When the transmitting station is not co-operating, the use of a loop antenna permits it to be cut out when the local signal is introduced by turning the loop 90° to the directional blind spot. If desired, the antenna may be cut off entirely, and the comparison made directly against the local source feeding into the receiving set.

One of these measuring sets was made up and mounted in an automobile truck. The loop antenna is placed on top. This set was used in making a study of the field strength of the broadcasting stations mentioned above. It was found that at 400 meters these stations are handicapped in transmitting through the maze of steel structures of Manhattan. Also, it is apparent that the two high buildings are less favorable sites than the 14-story building at 2XB.

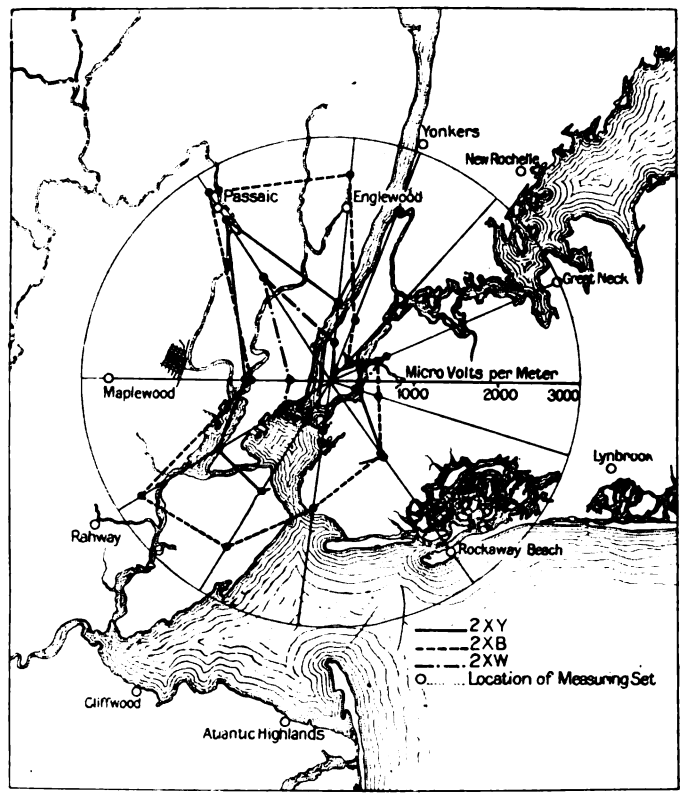

Fig. 2. Map showing the results in field strength of various stations taken at several places for the tests on "dead spots."

The results obtained demonstrated that field measuring sets are valuable experimental tools. For this reason, a set was built employing the Western Electric "N tube" or what is properly known as the "peanut tube" throughout. This outfit, together with the loop, which is collapsible, can be placed in two suitcases such as are used by traveling salesmen for carrying samples

Dr. MacMillan Begins His Arctic Voyage—Radio Reports Received

Dr. MacMillan in Arctic costume—parka and mukluks

THE 89-foot schooner "Bowdoin," bearing Dr. Donald B. MacMillan and his party on their way to resume scientific work and explorations in the Arctic, sailed from Wiscasset, Maine, on June 23. The work begun on the Baffin Land expedition, from which Dr. MacMillan returned in September with the greatest collection of scientific and magnetic observations ever made in the Arctic, will be continued in Ellesmere Land, Northern Greenland. While he expects to return in fifteen months, Dr. MacMillan may be compelled to stay until the fall of 1925.

The party includes three who were on the previous trip. These are Ralph P. Robinson of Merrimac, Mass., assistant; Thomas J. McCue of Brigus, Newfoundland, mate, and Richard Goddard of Winthrop, Mass., sent by the Carnegie Institute to continue the observations in terrestrial magnetism and atmospheric electricity which he began in Baffin Land.

The others are Donald H. Mix of Bristol, Conn., an expert radio operator, sent by the American Radio Relay League, composed of 15,000 amateur operators in the United States; W. F. Lewis of East Lynn, Mass., cook, and John Jaynes of Somerville, Mass., an engineer.

Abram Broomfield, an expert driver of Eskimo dogs, will be picked up at Jack Lane's Bay, near Davis Inlet, Labrador, for his second trip on the schooner.

The "Bowdoin" is expected to reach Etah about August 20. At Cape Sabine the vessel will be allowed to freeze in for the winter, 660 miles from the North Pole.

The principal exploration will be a dog team trip over the ice cap of Ellesmere Land, an elevation of 4,000 feet, and down the other side into Eureka Sound, where big coal deposits which Dr. MacMillan found in 1914 will be investigated.

F. H. Schnell, traffic manager of the American Radio Relay League, announces that WNP (wireless North Pole), the "Bowdoin's" call, will transmit on wave lengths of 185, 220 and 300 meters. Donald H. Mix, radio operator on the "Bowdoin," will stand by from 10 P. M. to midnight for press reports from Arlington; at midnight for reports from NSS; from 1 A. M. to 2:50 A. M. he will communicate with amateurs; 3 A. M. to 4:59 A. M. he will attempt to work stations operating under a limited commercial license, and from 5 A. M. to 7 A. M. he will again try amateurs.

Messages with the prefix "urgent" will be used in emergencies and the amateur receiving such a message will be advised as to its disposition.

The first message from the "Bowdoin" was received at A. R. R. L. headquarters in Hartford, Conn., the day after she sailed. The words sent by Mr. Mix were clearly heard and reported by hundreds of amateur stations.

Before sailing Dr. MacMillan was asked the objects of his present voyage. He is reported as saying:

"The Carnegie Institute again is sending its representative, Richard Goddard of Winthrop, Mass., to make a study of terrestrial magnetism and atmospheric electricity. We also intend to study ornithology, glaciology and botany and to obtain a series of educational photographs of bird and animal life.

"In addition, millions of radio users will be interested in our radio experiment in seeking to keep in constant communication with the outside world through the aurora or northern lights. Many experts have contended that this is impossible. This experiment should eliminate speculation and substitute certainty.

"We hope that our radio experiments and study of atmospheric electricity will help to throw some further light on the effect of atmospheric conditions on radio reception and transmission."

Dr. Donald B. MacMillan, D. Sc., F.R.G.S., the leader of this expedition, was formerly a professor at Bowdoin College and was first induced to go to the Arctic by Peary. He accompanied Peary on the expedition on which Peary reached the Pole and has been back to the Arctic seven times since. Dr. MacMillan was the guest of honor at a dinner given at the Hotel Sherman, Chicago, last spring, by U. J. ("Sport") Herrmann, who incidentally is the owner of the Chicago Radio Show, one of the owners of the Boston Red Sox, and a well known Chicago yachtsman. This dinner was a private affair, attended by prominent naval officers and city officials.

During his talk Dr. MacMillan told of the hardships of the Arctic. He said that the greatest hardship is not, as is commonly supposed, the intense cold—which sends the mercury sometimes as low as 60° below zero—that it is not the privations (for on one expedition which Captain MacMillan commanded he demonstrated that he and his crew could live for a year on nothing but the food which sustains the Eskimo), but that the greatest hardship is the awful solitude—everything going out and nothing coming in. Mr. Herrmann, who from the start has been intensely interested in radio, inquired why he, MacMillan, did not take along a radio set. Dr. MacMillan replied that it would take up too much space. There developed a considerable discussion of just what radio would do, in which discussion Dr. MacMillan became greatly interested. As an outcome he arranged to install both sending and receiving sets aboard the "Bowdoin" and converted the entire forward end of the forecastle into a radio room.

Dr. MacMillan takes with him, installed in the forepart of the ship, a Zenith long distance standard broadcast receiving set with a wave length range of from 150 to 900 meters, and equipped with three-stage amplifier and loud speaking apparatus, as well as a Zenith long wave receiving set with a maximum wave length of 20,000 meters. With these two sets reception will be possible of not only amateur telegraph and phone stations and radiophone broadcasting stations, but also naval and commercial transoceanic stations from which press reports, time signals, weather forecasts, etc., can be secured.

The transmitting equipment consists of a Zenith 500 cycle interrupted-continuous-wave set, using two 250-watt transmitter tubes and the Armstrong regenerative circuit. This apparatus is mounted very compactly in semi-panel form with all necessary meters, and is supplied with current by two gas engine driven Delco generator units entirely separate from the regular power plant of the ship.

The ship's antenna is of peculiar construction, due to the fact that the "Bowdoin" depends for part of its

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Radio and the Woman

By Crystal D. Tector

FRIEND HUSBAND has come back from his fishing trip brown as a berry and twice as hungry as he ever was. He collected a store of radio information from the guide who had a wonderful set up in his cabin on the lake. F. H. said that he did not have to even use his little set because "Pop," as he called the guide, happened to be a rabid amateur, with a transmitter and a wonderful receiver. Now nothing will do but for us to get a license and a transmitter and start in to "mess up the ether." Well, you can take it for granted that he will be the only one that uses it, because I have no intention of making our neighbors wish that we were in South America, because of spoiling their evening's DX listen-in.

* * *

He sent me a telegram the day before he left and we both received it two days after he got here. That gave him a great laugh and he said, "Well, supposing that I had been sick and wanted you to come up. I could have passed out before you would ever hear about it." The young fellow that gave it to us, however, explained by saying that it was routed through New Jersey, instead of New York, and landed up in Roselle Park instead of our town, and like a letter it had been floating around until it found us. Wonder if you would call that a magnetic field?

Handy in Warm Weather

WEARING your phones in the warm weather sometimes proves discomforting, due to the heat. This can be alleviated and the wearing of phones made a comfort even in the warmest of weather. The method to pursue in doing this is: Get two rubber sponges at the nearest drug or 5 and 10 cent store. Cut a hole in the center of each sponge and place them on the head set. Then the phones can be worn and the rubber sponge will keep you nice and cool, and prevent the phones from pressing tightly against your ears.

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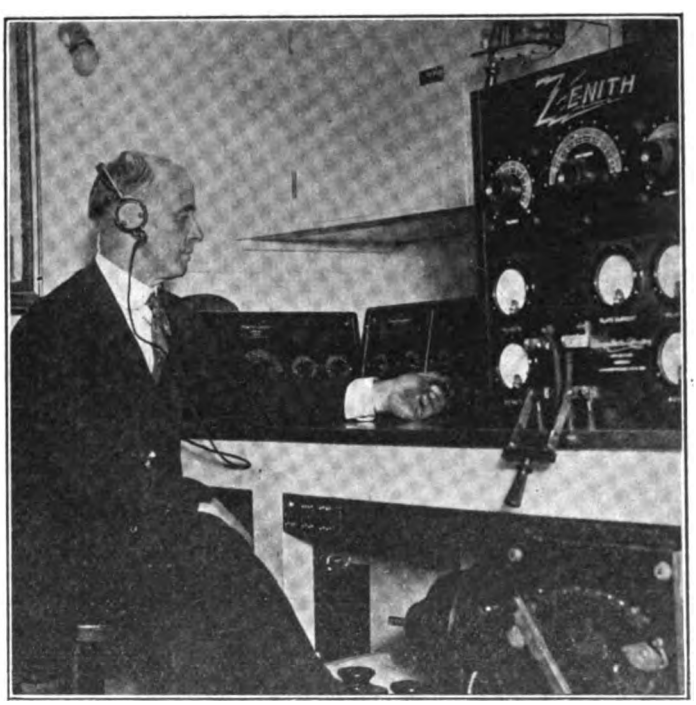
motive power on sails and is of comparatively short length. A stem to stern antenna is used, passing over the main mast and foremast, the lead-in dropping through the foredeck to the radio quarters. In order to insure good ground, steel and copper plates have been riveted to the hull and in addition, connections have been made to the propeller shaft through the engine and to the supply of coal which is carried partly as ballast and for emergency use.

The Government has assigned wave lengths of 200, 300 and 400 meters and has also given permission for Station WNP to use whatever wave length it may find necessary for experimental purposes.

It might be interesting to figure out just how Uncle Sam would move against an ice-bound ship in the Arctic, hundreds of miles from civilization, if its wave length were found to interfere with that of other sending stations!

The American broadcasting station which will be used to send messages to Dr. MacMillan is the new Zenith-Edgewater Beach Hotel Broadcasting Station WJAZ, which incidentally is the most powerful broadcasting station in the country, having 4,000 volts and 10 kilowatt output. This station will not only be used to give Dr. MacMillan and his crew of seven entertainment and news of the day, but it will also be used by the families of Dr. MacMillan and his crew when they desire to send messages to those aboard the "Bowdoin" in the frozen north.

There is a period of 141 days in the Arctic during which a message sent at midnight must pass through hundreds of miles of sunlight before it reaches darkness. It will be interesting to see what effect these peculiar conditions of the Arctic have on radio communication. Up to the present time it has been thought that the so-called auroral band would act as a powerful deterrent in transmitting radio messages. At all events, there is no record of a message ever having been transmitted from the north through it. It will be interesting to learn to what extent the auroral band will interfere, and it is quite possible that scientific data of great importance will be gathered about the Aurora Borealis, which has always been a mystery. Never before have all the amateurs of the country focused their receiving



Dr. MacMillan in the radio room of his Arctic vessel "Bowdoin."

sets upon a single isolated station in the frozen north. It will be interesting to learn what portions of the country receive these messages clearly and what portions do not receive them at all.

Dr. MacMillan on his expedition primarily intends to study terrestrial magnetism. He will also co-operate with the Weather Bureau and Professor V. B. Ekerold, the distinguished Norwegian meteorologist, who helped establish the wireless weather station at Jan Mayen Island off the coast of Greenland.

Get the
BASEBALL SCORES ALL SUMMER
Take a Radio Set along with you.

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"Broadcast Central" with Special Land Lines Covers the Country

LOCATED in the heart of New York's musical and theatrical district, where entertainment of the highest order is ever available, "Broadcast Central" offers to the American public the most elaborate radio programs, with a degree of faithfulness in reproduction that marks the beginning of a new era in radio broadcasting. The wires which tower 400 feet above the street on Aeolian Hall, at Fifth avenue and 42nd street, provide two antennas, and this super-station will transmit two broadcast programs simultaneously on different wave lengths.

The closing of station WJZ at Newark, New Jersey, operated jointly by the Radio Corporation of America and the Westinghouse Electric & Mfg. Company, coincided with the opening of "Broadcast Central." The well-known call WJZ was retained for transmission from the Aeolian Hall station on 455 meters, while the call WJY will be used for the other wave length of 405 meters, both of which wave lengths have recently been allocated.

The new station is fitted with a double antenna and

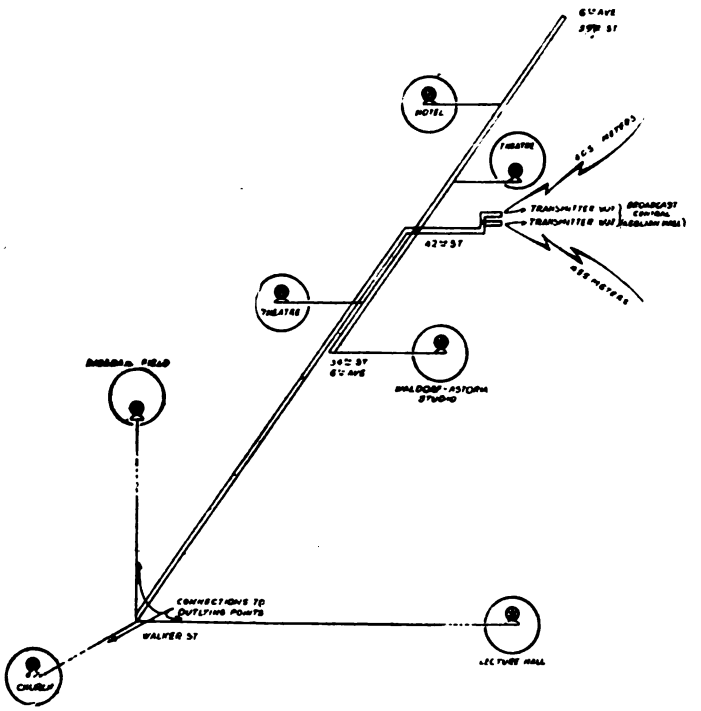

Fig. 1. Outside private cable system of "Broadcast Central" enabling WJZ and WJY to transmit direct from distant points as shown.

two independent transmitters which will permit a dual program to be broadcast; one of classical or serious entertainment, the other of popular airs, dance music and lectures.

The Radio Corporation of America has made a thorough analysis of the types of programs best suited to the requirements of the public and this study has revealed the fact that generally the radio public may be divided into two classes—those who prefer classical or similar entertainment and those desiring dance music and popular airs.

Not only will transmission be carried on from the two studios which are a part of the station, but the main recital hall of Aeolian Hall has been connected to a switchboard in the station thus providing at frequent intervals another source of the finest music obtainable.

To guard against interruption in programs, two spare transmitters are installed together with the necessary controlling apparatus which will enable the operator to make an instantaneous change from one set to another should any trouble develop.

"Broadcast Central" is a model station both in electrical design and operating facilities, incorporating the most advanced ideas of RCA engineers. One of the outstanding improvements is the "checking up" of the broadcast programs for clearness in transmission. This is accomplished by a "moving picture" device con-

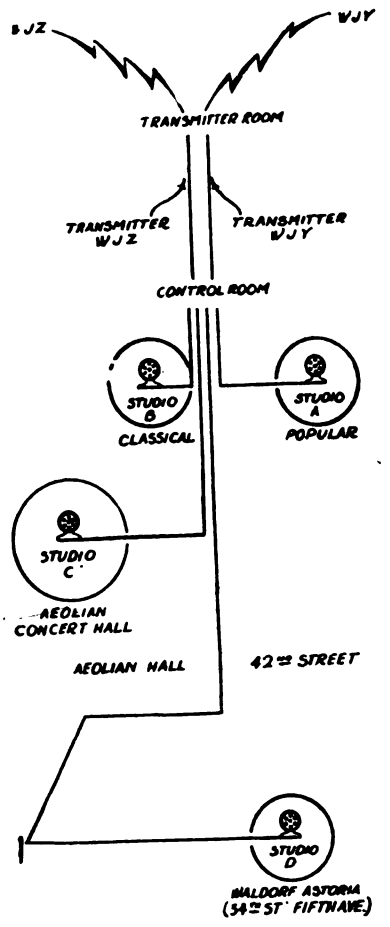

Fig. 2. Studio system of "Broadcast Central." The two studios located on the sixth floor of Aeolian Hall, the studio of the concert hall and that of the Waldorf-Astoria are all connected by private cables and can be plugged in from the control room.

nected with the antenna which shows at a glance the perfection in reproduction of music or voice as the radio waves leave the antenna. Any distortion occurring during a rendition may be instantly corrected by the operator who watches the electrical vibrations as they radiate into space.

The following summary of outstanding facts about "Broadcast Central" will be of interest:

Call Letters: WJY designates the 405-meter transmission, while WJZ designates the 455-meter transmission.

Location: Heart of New York's musical district where the finest of entertainment is ever available. (29 West 42d St., N. Y. City).

Towers: There are two self-supporting steel towers erected on the roof of the building. They are each 115 feet high and their total weight is 15 tons.

(*Continued on next page*)

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Who's Who in Radio Inspection

EVERY amateur and broadcaster should know the officials of the Radio Section of the Department of Commerce in his district, so that he can get advice, keep in touch with new regulations and not be imposed upon by bogus representatives.

At headquarters in Washington, Chief Supervisor of Radio W. D. Terrell is in charge under Secretary Hoover and Commissioner Carson. Mr. Terrell is assisted by W. E. Downey, Supervisor of Radio. In the nine districts with headquarters as shown, the following men are in charge:

District	Headquarters	Supervisor of Radio
1st	Boston	C. C. Kolster
2nd	New York	Arthur Batcheller
3d	Baltimore	R. Y. Cadmus
4th	Atlanta	R. Y. Cadmus (until relieved by Van Nostrand)
5th	New Orleans	Theodore G. Deiler
6th	San Francisco	J. F. Dillon
7th	Seattle	O. R. Redfern
8th	Detroit	S. W. Edwards
9th	Chicago	E. A. Beane

Some recent changes in the personnel of the districts have been made. A. F. Parkhurst, Assistant Radio Inspector at Detroit, has been transferred to the 9th District at Chicago. Assistant Inspector H. S. Pyle has been appointed to work in the Detroit office, replacing Mr. Parkhurst. Assistant Inspector L. E. Richwien, of the Baltimore office, has been detailed to the 7th District at Seattle. It is planned to open the office at Atlanta as the headquarters of the 4th District soon, and Radio Inspector Wallis Van Nostrand, Jr., now at Norfolk, will probably be designated as supervisor of this division.

Radio Interference Disappearing

OFFICIALS of the Department of Commerce report that the schedule of new wave lengths for broadcasting stations has met with a cordial reception throughout the country, and that improvement in reception is noted almost everywhere.

All nine Radio Supervisors report satisfactory results in the allocation of the Class B and A wave lengths, stating that almost all listeners-in are experiencing better reception than ever before in summer time, even with atmospherics at their height. Last summer they point out some five hundred stations were operating on 400 and 360 meters, whereas today the B stations have some nearly 40 exclusive national waves, and the A stations have thirty-one waves assigned individually in the nine radio districts.

The real success or improvement brought about by the wave allocation will not be fully appreciated until later in the fall.

Over three hundred of the old stations continue in Class C, satisfied apparently to operate on 360 meters. Experts of the department express some surprise at this condition; they hoped for early applications for transfers to Class A and B with independent wave lengths. Although no new stations are being licensed under Class C the fact that over three hundred stations, scattered all over the country, continue to transmit on the 360 meter wave tends to maintain interference which it was expected would be eliminated to a greater degree.

A member of the radio section pointed out to the writer that if the radio receivers would use shorter, single wire antenna and listen in on the shorter wave Class A stations, some atmospherics would be eliminated. Reception should be better. The use of loops and indoor aerials is also recommended.

(*Concluded from preceding page*)

Antenna: Consists of two independent sections supported between towers. Height above street level is 350 feet. The two sections of wires have individual "lead-ins" to the transmitting house on the roof.

Wave Lengths: Each section of antenna is energized by an individual transmitting set permitting a double programme to be broadcast on two wave lengths without mutual interference. This combination of two independent aerials with associated equipment permitting simultaneous broadcasting is an exclusive feature of "Broadcast Central."

Studios: One studio has been provided for each transmitting channel, one for classical music, the other for popular airs, lectures, etc. In addition, special wires are installed from the main recital hall of the building direct to transmitting house on the roof. On certain occasions special events or recitals will be broadcast direct from this large hall.

Emergency Equipment: For each channel there are two complete transmitting sets. These spare sets may be connected into the circuit of each antenna by the simple manipulation by a switch. This provision will prevent any interruption of programmes through the failure of any transmitting set.

Device "Checks Up" Programme Broadcast: A new device inserted in the antenna circuit of each channel indicates the clarity of transmission. The operator in charge can, at a glance, actually observe the degree of perfection in the reproduction of a programme. A switchboard near this instrument enables the operator to correct any distortion in transmission that may occur.

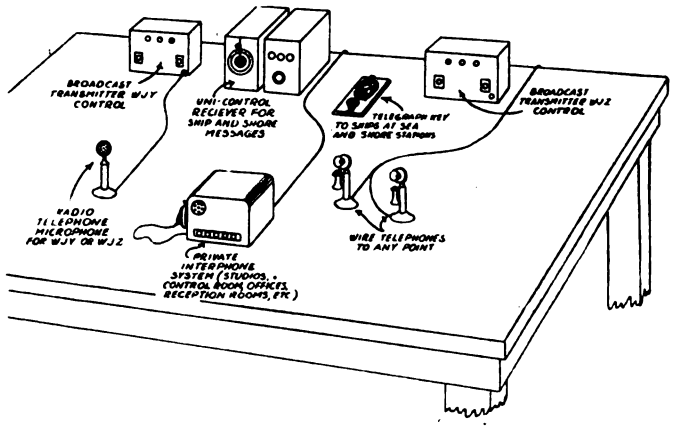
BROADCAST TRANSMITTER WJY CONTROL
UNI-CONTROL RECIEVER FOR SHIP AND SHORE MESSAGES
TELEGRAPH KEY TO SHIPS AT SEA AND SHORE STATIONS
BROADCAST TRANSMITTER WJZ CONTROL
RADIO TELEPHONE MICROPHONE FOR WJY OR WJZ
WIRE TELEPHONES TO ANY POINT
PRIVATE INTERPHONE SYSTEM (STUDIOS, CONTROL ROOM OFFICES, RECEPTION ROOMS, ETC.)

Fig. 3. Transmitter room communication table at "Broadcast Central." This is the "heart of the station" as it is from here that the control of both stations is covered. Each station has two channels through which it transmits, and both are controlled from this table. Here the chief operator sits and regulates the transmission at the same time listening in on ship length so as to be able to shut down immediately in case of an SOS.

The Heart of "Broadcast Central": The control equipment located in the transmitting room on the roof is the heart and nerve centre of the system. The operators have before them a microphone through which they can talk by radio telephony, a key by which they can converse in dot-dash telegraphy and telephone equipment which provides communication with any point in the United States. An inter-communication system provides for internal communication between studios and transmitting room.

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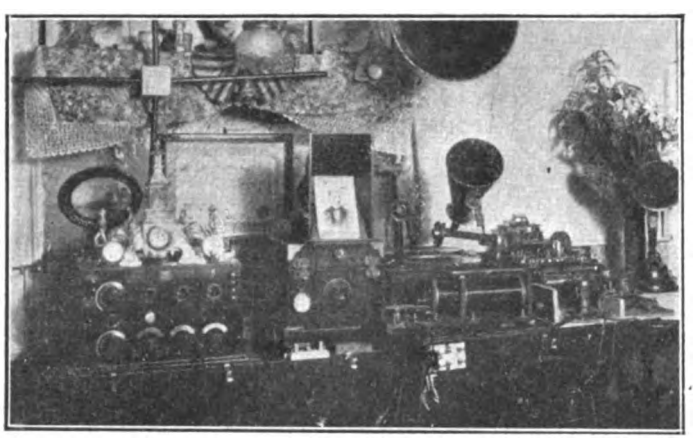
RADIO PRIMER

INTERFERENCE. One of the common troubles experienced by the radio fan these days is interference. It is experienced mostly by the single tube sets, or crystal sets. This is because of the fact that neither of these two types is capable of very sharp tuning.

To illustrate tuning and interference and what is meant by it, it is best to depart from radio principles and go back to elementary physics.

If we take two musical instruments, such as two violins, and tune each of them exactly the same, we can cause one to vibrate independently by simply plucking a string of the other or drawing the bow across one of the strings. This is because when we pluck one of the strings it vibrates and causes the surrounding air to vibrate. The second string picks up these vibrations, and vibrates with them. Now if we place our finger on the string and shorten it, and pluck



Impressive station of James F. McEvoy, 37 Fourth Street, New Brighton, Staten Island. He started in last July with a simple crystal set and now is the possessor of numerous sets, including a three stage R. F. set for loop work.

the string again, we will find out that the second violin will not vibrate. We have shortened the string, causing it to give out vibrations of much shorter length and higher speed, and they do not affect the second. That illustrates sharp tuning.

Now if we take a third violin and tune it the same as the other two, we can cause the second violin to vibrate from two different sources. If we take the first violin and cause it to send out intermittent vibrations by stopping and plucking its string, the other two will vibrate intermittently in unison. If we cause the first and third violins to vibrate, the first violin intermittently and the third continuously, the second one will vibrate continuously, due to the fact that the third one is interfering with the vibrations of the first and all three being tuned the same they all respond to the same note or wave length.

Now if we carefully tune the first two just a little bit higher or lower, we can cause either one of them to vibrate in unison by plucking them, and at the same time the note from the third will not have any effect on them. The reason is that they now do not respond to the same vibrations as the second and therefore no interference is caused.

A radio set is practically the same. If two stations are transmitting on the same wave length or frequency, a third station that is receiving will hear them both, and because they are both transmitting on the same wave he will be unable to hear either one distinctly on account of his receiver responding to the ether vibrations of both at the same time.

If we therefore lower the wave length of one of the transmitters it is then possible for the third station to pick either one at random—if the receiver is capable of sharp tuning. A crystal set will pick up signals over a fairly broad band of wave lengths, and while it may receive one a good deal louder than any of the others, it is still possible to hear the others when the strong station pauses or stops.

A great deal of the so-called interference would be stopped if the owner of a receiver learned to tune it properly, or if it is a single circuit receiver it can be stopped or decreased by the use of a shorter antenna or energy collector.

Methods of decreasing interference. A lot of interference can be eliminated at the receiving end. That is, of course, when reception is desired from stations that are not on exactly the same wave length. If two stations are both transmitting on the same wave length tuning is impossible. But where one station is higher than the other, and signals from both stations are heard at the same time, it is possible in most cases to eliminate one and only hear the other.

As before stated, the shortening of the antenna to around 80 feet will help. Then the amount of wire used in the wiring of the receiving set should be as short as possible.

A lot of receivers do not use tuned secondaries, or ticklers. If the tickler or secondary is tapped at about half its usual value and a two bladed shorting switch used, it will help the tuning immensely. Then along the same method, if instead of a single blade switch being used for the primary or antenna tuner a double blade switch is used and fixed in such a manner that it will short two of the following sections of unused wire, it will eliminate dead end effect and accordingly sharpen the tuning of the receiver. The use of extra capacity in any of the circuits should be omitted as far as possible, and where a circuit does not call for condensers, nothing can be gained by their use. Fixed condensers should never be used across inductances that are used for tuning as their use broadens the tuning considerably, sometimes to such an extent that tuning is practically impossible.

Three New Class A Stations Licensed

THREE new Class A Broadcasters were licensed by the Department of Commerce during the past week, and seven stations were transferred from Class C on 360 meters to Class A status.

New Class A Stations

Call	Station	Meters	Kcys	Watts
KFHU	—Sateren, M. G., Mayville, N. D....	261	1150	50
WRAZ	—Radio Shop of Newark, Newark N. J.	233	1290	50
WSAG	—Davis, Loren V., St. Petersburg, Fla.	244	1230	10

Transferred from Class C to Class A

Call	Station	Meters	Kcys	Watts
KFDD	—St. Michael Cathedral, Boise, Idaho	252	1190	10
WDAJ	—Ervins Electric Co., Parsons, Kan...	258	1160	15
WHAD	—Marquette University, Milwaukee, Wis.	280	1070	100
WIAB	—Joslyn Automobile Co., Rockford, Ill.	252	1190	50
WMAT	—Paramount Radio Corp., Duluth, Minn.	266	1130	25
WQAN	—Scranton Times, Scranton, Pa....	280	1070	100
WWB	—Daily News Print Co., Canton, Ohio	268	1120	200

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New York Department Store Broadcasts Musical Comedy

RADIO fans had the opportunity of hearing a unique musical comedy on the night of June 28, when "Once Upon a Time," written and produced by employees of R. H. Macy & Co., Inc., New York City, was broadcast from Station WJY. The performance was given on the 405 meter wave length.

Richard Barriscale, brother of Bessie Barriscale, film star, is the author of the play and its hero. A number of tuneful songs written by Jack Straus, son of the president of Macy's, Ralph Goldstein, and Mr. Barriscale were rendered, among them: "When You Smile," "Hearts Are Trumps," "Hitch Your Wagon to a Red Star," "He's Getting Better Day by Day," "You'll Think of Me Sometimes," "May-Ga-Lanka Blues," and "Macy Mine."

The operetta was originally produced last month at the Central Opera House under the auspices of the Community Club, an organization of Macy employees. A great deal of attention was attracted to it at the time by the Beauty Chorus, whose pictures were later featured in newspapers throughout the country.

Another hit was a burlesque on the Floradora Sextette by six husky delegates from the store's delivery department, who donned ballet costumes to lend an air of realism to their performance.

One of the comedians heard in the broadcasting was Guy Somers Mitchell, who was formerly in vaudeville with the song and dance team of Somers and Le Grand. Mr. Mitchell took the part of the Sphinx of Gizeh.

The play was condensed for broadcasting purposes by Miss M. C. Sidney, head of Macy's Department of Training, who was formerly on the stage. Mrs. V. C. Sidney, her mother, who is one of the characters of the play, had a long theatrical career under the stage name of Vida Crowley. During the war she was in France with the Y. M. C. A. canteen service.

Miss Kathleen Graelish, who played the double part of Sally and Irene, has been heard over the radio before. So has William Francis. Both collaborated in the Christmas stories sent out by WJZ.

Frank Logan, assistant radio buyer at Macy's, coached the characters on the essentials of a good broadcasting voice. Miss Phyllis Reid assisted Miss Sidney in the rehearsals. Musical numbers were rendered by Julius Lenzberger's orchestra.

Guy Somers Mitchell and some of the girls from R. H. Macy's "tuning up" before broadcasting the play "Once Upon a Time" from Station WJY, New York. The entire production was written and staged by employees of R. H. Macy & Co., New York City.

Summer Tips to Summer Fans

By R. L. Dougherty

NOW that the season has started and many amateurs and fans have packed their radio sets into trunks or constructed portable sets to take on their cars or up to their camps, a lot of funny troubles will arise that will seem to have no solution and will tend to discourage the fan.

These little troubles are of such nature that they will sometimes mystify you, even though they may not seem to have any direct bearing on the receiver's range. The first and foremost of these troubles will be noticed when the receiver will respond only to signals from one direction and "lay down" on the station that is supposed to be the strongest in the section. "Why, I can't even get a peep out of XYZ, and yet I get that weak station ZYX O. K.," will be the sad story. Well, the reason for this is that there is some condition in the surrounding country that is causing the signals of one station to be absorbed whereas the other station is not bothered. A look around the country will generally reveal a heavily wooded hill or a forest which is causing the trouble. This cannot be remedied without moving the location of the set to the other side of the disturbing factor, and when that is done, no signals will be received from the opposite direction, due as before to certain signal absorption.

The next and most troublesome aspect will be found when a ground is wanted. If you are camping, near a stream of course a good ground will be perfectly easy, or if you are using a loop receiver it will not bother you at all, but in cases where it will seem that you have a perfect ground, your set will sometimes act peculiarly, and the tuning will be extremely sharp, too much so for comfort, and the signals will be weak and unsteady. If after a heavy rain the signals are noticed as increased and the tuning nearer to normal, you will know that your ground, no matter how good it looks is poor. A good way in which to assure yourself of a positive ground is to dig a small hole about a foot wide and three or four feet deep. Into this place on the bottom a layer of soaking wet charcoal, ashes or anything that will hold moisture. Then take the ground wire and solder it to an old tin can, which you have first soldered to a piece of tin or old iron. Place this in a hole and pour plenty of water around it—fill the hole up a couple of times with water and let it soak into the ground. Then put more damp earth or earth and charcoal around it and leave it alone, except for keeping it soaking wet all the time.

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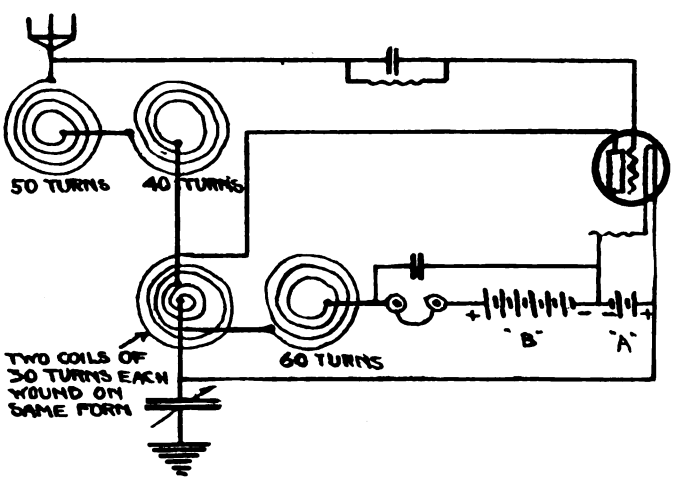
Homemade Sets for the Government Lighthouse Service

By Arthur G. Shirt

PLANS for a complete radio receiver and instructions for building it have been issued by the Bureau of Lighthouses, Washington, D. C., for the information of the Field Employees of the Lighthouse Service. The receiver was designed by Mr. A. W. Tupper, Assistant Engineer of the Bureau, and was developed mainly along the lines of simplicity and ease of construction, sacrificing nothing, however, which would tend to make it more efficient. Mr. Tupper spent several months investigating a number of the simpler forms of regenerative circuits published in the many radio magazines before he evolved the set which he now recommends. The results of his investigation have been published in a Departmental circular, have been supplemented with blueprints, and are now ready for distribution to the lighthouse keepers and to others in the service who have evidenced their interest.



Circuit diagram of the lighthouse set. There are four spiderweb coils used. The one in the plate circuit has two windings, as shown, to supply feedback.

The set recommended is a single circuit regenerative receiver which makes a somewhat novel use of two spider-web variometers. One variometer is used to vary the inductance in the antenna circuit, while the other not only tunes the plate circuit, but also secures regeneration by acting as a feedback inductance. This novel effect is obtained by winding an extra antenna inductance of 30 turns on the primary form of the plate variometer. Inductance is thereby set up between the antenna circuit and the oscillating circuit, varied by the movable secondary of the plate variometer.

This particular arrangement was finally decided upon as being best suited to a homemade set for the following reasons: The instruments involved are easily constructed from materials that are readily obtainable. The parts which must be purchased are inexpensive, excepting, of course, the detector tube and headphones. There are no critical values of the various parts which must be tested and adjusted until an ideal arrangement is obtained. The tuning is simple. The signals are loud and clear when there is no interference, and for a single circuit the selectivity is very good.

Six or more of these sets have been constructed in the course of testing the circuit, and the results obtained from them have been consistently satisfactory. While being tested in Washington, concerts were picked up from Boston, Chicago, Detroit, Kansas City, Atlanta, Davenport and sometimes Havana, Cuba. The number of turns on the various coils has been determined by actual tests and they are adapted for use with antennae in the neighborhood of 100 feet in length. The tubes recommended are of the dry-cell variety, and the cabinet is constructed so that the batteries incidental with such tubes are hidden from sight in a compartment at the base of the set. There is room in this compartment for storing an extra dry cell. The instructions contained in Circular Letter No. 2, which describes the set, are written in plain, non-technical language, and are complete in every detail.

The Panel

The panel should be a piece of close-grained wood ¼-inch thick. Before placing in the cabinet lay out all holes, taking measurements from blueprint, which is one-half actual size. Put rheostat and condenser in place to be sure the holes are in the proper places, then remove instruments and put panel in the oven and heat thoroughly to drive out all moisture, but be careful not to scorch. While panel is still hot, give it a thorough coat of thin shellac on both sides and all edges and in the holes. Let dry for 24 hours and give it two more coats of shellac at least 12 hours apart. *Do not paint this panel with ordinary paint.* If a color is desired, stain the panel with a spirit stain or water color stain before baking.

After the third coat of shellac is dry, cover the inside portion of the panel that is above the shelf with tin-foil, which may be stuck to the panel with shellac. While the shellac is still soft, scrape the tin-foil away from around all holes through the panel, so that no metal parts of condenser, rheostat, binding posts, or any of the wiring or wire terminals will touch the tin-foil.

Making the Grid Leak

Take a piece of photographic film (or heavy paper, if no film is obtainable) and cut it to the size of the grid condenser, making a hole in each end to correspond with the holes in the condenser where the connection wires are attached as previously described. Thoroughly roughen the surface of the film with sandpaper (after scraping off all traces of any picture which may have been on it) and with a soft pencil make a heavy wide mark around both holes, and draw a heavy pencil line from one hole to the other, then secure this to one side of the grid condenser by the screws with which you make the wire connections, being sure that the head or nut of each screw touches the pencil mark you made around each hole. After you have succeeded in tuning in a station, try out the grid-leak by making the pencil lines heavier or erasing them partly until the clearest and loudest signal is obtained. The amount of this grid-leak depends on the qualities of the detector tube, some tubes requiring no grid-leak at all, others requiring a heavy, broad pencil mark.

The instructions for constructing and erecting antennae and for making ground connections are furnished on a separate sheet. Four blueprints accompany the present circular, showing in detail how the apparatus is assembled and wired, as well as the methods of winding the spider-web coils. No provision is made for the addition of one or two steps of amplification, that being left to the skill and other requirements possessed by employees of the Lighthouse Service.

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This Crystal Detector Set Has Many Advantages

By Ervin J. Trojan

[The set described below, says the author, has been thoroughly tested and found worth while and its merit proved by public approval. Large numbers of these sets are in use in Chicago and are giving satisfactory service.—Editor, RADIO WORLD.*]*

DURING the early part of 1921, when radiophone broadcasting first appeared, development of receiving sets was pushed feverishly; so feverishly indeed, that some devotees of the ether waves were neck-deep in superregenerative sets and other highly complex circuits before they even realized that a simple crystal detector would also receive radiophone signals.

Of course, a crystal detector set will not receive long distances and its output of sound is limited. But where such a set can be used within 15 or 20 miles of a moderately powerful broadcasting station, these drawbacks are very slight. And deep down in our inner consciousness we might even concede that a local concert, heard over a good crystal set, will sound better than one a thousand miles away, heard over an engineering marvel, but slightly mixed with interference and fading.

For the novice who wishes to begin enjoying the pleasures of ether-borne music, or for the person who wishes to make his first set, a crystal detector set is recommended. It will not cost much, it is sure to work, and it will serve as a stepping stone to the more complicated and expensive sets. The initial cost of such a set is very low; its upkeep is nil; it is simple to construct and to operate; it is non-interfering and all but insensible to static; for clarity of tone it has no superior.

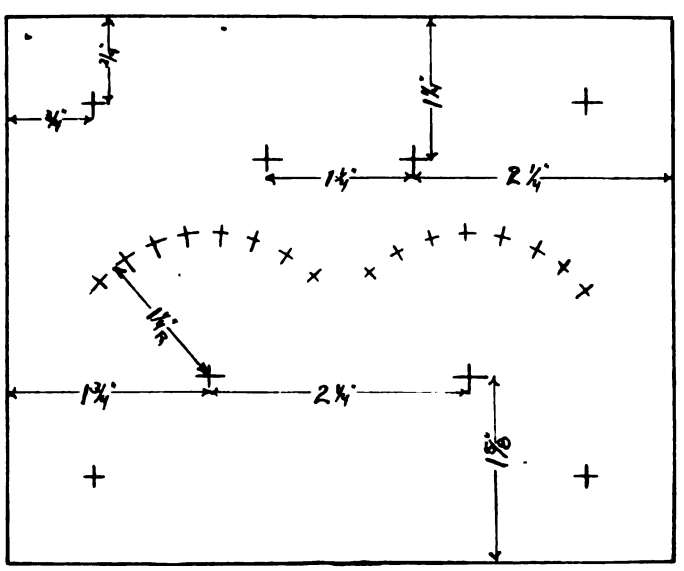

Fig. 1—Panel layout for an efficient crystal set.

The writer will describe a small crystal detector set which has proven very popular, largely because of its pleasing design, low cost and efficiency. The complete set is about the size of an ordinary book, and has but three controls—adjustable crystal detector, coarse and fine tuning switches. The wave length range with a 60 foot aerial is approximately 300 to 500 meters.

The material required for the construction of this set will be as follows: ¼ inch whitewood, two pieces each, 1¼ inch by 5 ¾ inch, 1¼ inch by 4¼ inch, 4¾ inch by 5¾ inch; 4 binding posts; 2 switch levers, 1¼ inch radius; 1 crystal cup; 1 detector stand; 1 radiocite crystal; 12 contact points; 4 switch stops; 2 oz. No. 26 D. C. C. wire.

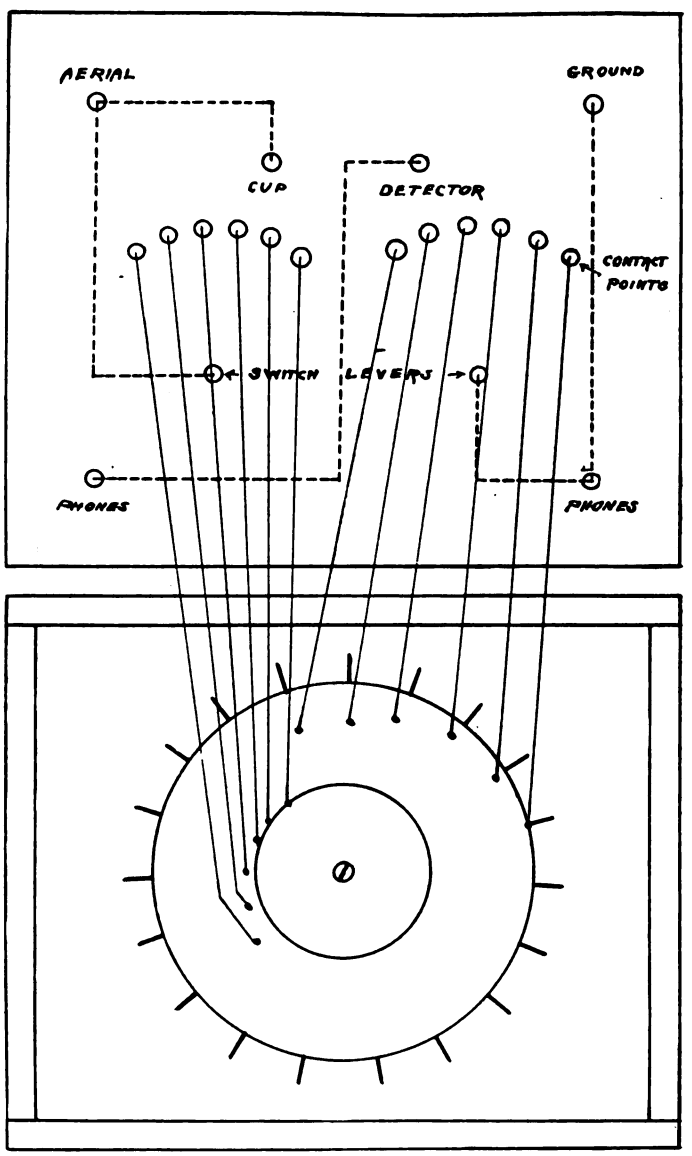

Fig. 2—Arrangement of instruments inside cabinet.

Drill one of the large pieces of wood, which will be the panel, according to Fig. 1. Construct the box as in Fig. 2, gluing and nailing all joints except the panel, which should be fastened temporarily with four small brads. Sandpaper well, stain to the desired color and apply at least two coats of varnish or shellac. Then remove the panel and assemble the various parts on it. After assembly the panel should be wired from

(*Concluded on next page*)

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

The automobile industry set a new production record in May by turning out 350,180 passenger cars and 42,983 trucks, according to figures from the Department of Commerce. Now let's see that they're all radio equipped!

* * *

Dr. W. R. Whitney, director of the research laboratory of the General Electric Company, was recently elected a member of the corporation of the Massachusetts Institute of Technology for a term of five years. He was graduated from the institute in 1890.

* * *

Station WOR, operated by L. Bamberger & Co., Newark, N. J., has arranged to have the New York *Morning Telegraph* broadcast, every Monday evening, its moving picture news and reviews. The series of talks, which will be called "Current Motion Pictures," is scheduled to begin on the evening of July 9.

* * *

Boy Scouts of America National Council, consisting of 1,300 representative business and professional men from all parts of the United States, will hold its thirteenth annual meeting on July 8 and 9 at Palisades Interstate Park, New Jersey. It is expected that Station WEAF will broadcast the proceedings and activities of July 9 to the whole country.

* * *

Dr. Lee De Forest, inventor of the phono film and manufacturer of radio equipment, returned from Europe last week with the impression that English newspapers were boycotting the broadcasting of news items and that members of the British theatrical and musical professions were opposed to radio broadcasting. He pointed out that there were but eight broadcasting stations in England and that the government had declined to issue any more permits.

Station WHAH, operated by Hafer Supply Company, Joplin, Mo., is now working on 250 watts.

* * *

Dr. Samuel Wesley Stratton, president of the Massachusetts Institute of Technology, Cambridge, Mass., received the honorary degree of Doctor of Laws from Harvard University at the recent annual commencement.

* * *

A correspondent of WGY who has beautiful faith in the efficacy of radio in the capture of criminals, recently requested the General Electric Company station to announce that a reward of $50 would be paid for the arrest of the "parties" guilty of chipping words off the family grave stone.

* * *

College students are working in the places of striking shop craftsmen in the Olean, N. Y., shops of the Pennsylvania Railroad. The students are from Purdue University, Pennsylvania State and Ohio State universities and technical schools. They are studying engineering, and went to Olean for practical experience. The railroad has asked the colleges and universities by radio for men seeking work in the courses they are studying.

* * *

All records for wireless transmission and reception were broken on the recent trial trip of the S.S. "Leviathan." On the last of the five days' run the four radio operators—Lieut. John R. Irwin, Elmo N. Pickerill, Anthony Tambourino and Raymond J. Green—were about exhausted. General Manager David Sarnoff, of the Radio Corporation of America, who was one of the guests aboard and who began his radio career at the key, jumped in and helped in transmitting, easing the strain on his men.

(*Continued from preceding page*)

underneath, as shown by the dotted lines. The schematic diagram appears in Fig. 3.

The tuning inductance used is popularly known as the "spiderweb." This form of winding has perhaps the lowest distributed capacity of any. Here it might

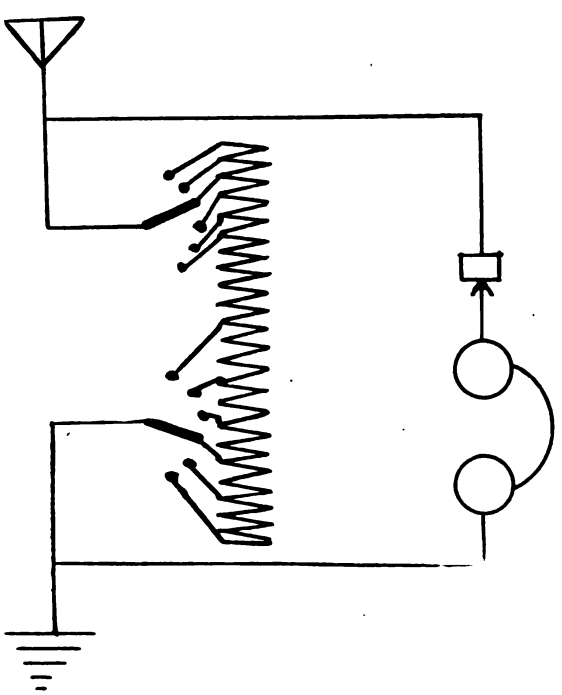

Fig. 3—Circuit diagram of receiver of Trojan's crystal set.

be advisable to add that no tuning inductance, of whatever form, should ever be coated with any varnish, shellac or cement. These substances all have a higher specific capacity than air, and will impair the efficiency of the coil. The spiderweb is made by cutting out of heavy pressboard or 1/32 inch fiber two disks, each 1½ inch in diameter. Lay one of these disks on a flat surface and space on it radially 19 wooden spokes, 1/16 inch in diameter by 2 inches long. A round type of hardwood toothpick answers admirably for this purpose. Pour glue over the ends on the disk, and place the other disk on top. Place a heavy weight on the finished form and let dry. This makes a winding form of ample rigidity and light weight. To wind the coil, make a reference mark on the tip of one of the spokes, and starting at that spoke, weave the wire in and out between the spokes, skipping two spokes at a time. When twice around make a loop in the wire about ⅛ inch in diameter. Wind two more turns and make another loop. Repeat until five loops have been made. This constitutes the fine adjustment. Now wind twenty turns, and make a loop. This is the body of the coil. Next wind eight turns and make a loop. Repeat four more times, but instead of making the last loop, cut off the wire. This constitutes the coarse adjustment. The coil should now have six taps at the inner end, and six taps at the outer end. Fasten this coil inside the box to the bottom with a small brass screw, and solder short wires from the taps to the contact points on the panel, as shown. See that these lead wires do not touch each other, and fasten the panel to the box permanently.

The crystal recommended is tellurium sulphide, better known by its trade name of "Radiocite." It is not quite as sensitive as a good crystal of galena, or lead sulphide, but it is more reliable and will give satisfactory results. Always handle the crystal with forceps; handling with the fingers will deposit oil and perspiration on the sensitive surface of the crystal and impair its usefulness. Should this happen, however, the crystal can be cleaned with alcohol or soapy water. Crystals should not be mounted in lead or low melting solder, as any heat much above body temperature will injure them.

This set, if properly constructed, will give as good results from local stations as a simple vacuum tube detector.

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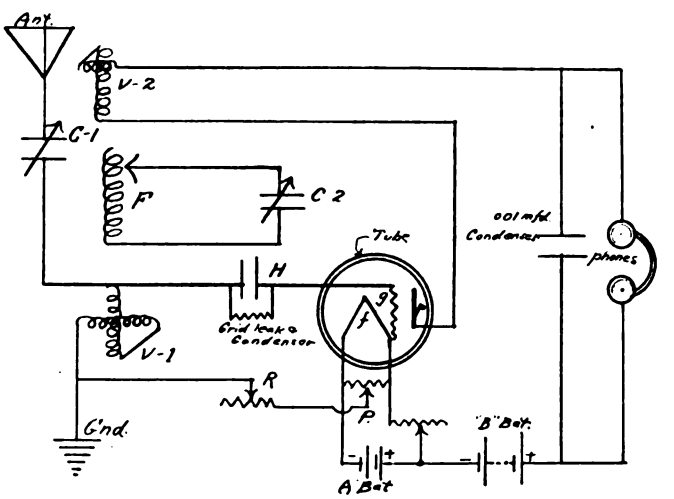
A Combination of Two Methods of Regeneration

By C. White, Consulting Engineer

BEFORE I start this article I want to thank the many amateurs who have written to me concerning my super amplifier, and I want to say that all letters will be taken care of in the proper way. I greatly appreciate the confidence my readers have placed in me and I shall be glad to perform a similar service for them whenever it is necessary. There are many surprises in store for you along the radio line. I am working up several new things in my laboratory at present, and as soon as I can get the goods in the hands of a reliable manufacturer and working in a commercial way, I shall write up some new applications and circuits. When anything new appears in my articles in the way of radio parts and you can not obtain them readily in your locality I am always willing to put you on the right track if you will address me in care of RADIO WORLD and enclose return postage. Many letters have come to me recently from radio dealers, and I want to welcome this type of correspondence.

The circuit to be taken up in this article is a modification of a circuit published under my name not so long ago. The improvement consists in the substitution of variometers in place of tapped and immovable coils. This addition goes far to make the circuit more effective and efficient in tuning. In reality there is a combination of two types of regeneration—namely, the two variometer feed back method and the electromagnetic tickler coil arrangement. Then again, a resistance R is inserted in the filament-grid circuit of the detector tube and is very effective in controlling regeneration with the new UV199 tube. The potentiometer P permits shifting from the positive to the negative side of the filament to obtain the best results. Some claim that the new tube works much better when it is connected up to the negative side of the filament on the grid return, while the manufacturers and others claim just the reverse. Personally I have found that in the majority of cases the negative side gives a little better results than the positive. The potentiometer P permits you to try either condition without disconnecting anything. The resistance R and the potentiometer P should each have a resistance of 400 ohms. In order to cut down noise in adjusting and tuning with these resistance units it is better to use a carbon pile type of rheostat or potentiometer although from the theoretical standpoint a wire type will work just as well. The condensers C-1 and C-2 are air variables having 23 plates apiece. A vernier attachment on both condensers is recommended. The coil F consists of 60 turns in all with the last 300 turns tapped for every ten turns for switch points and, if it is so desired, more frequent tapping of the coil can be resorted to, although three taps will suffice. The variometers V-1 and V-2 are nothing more than the ordinary standard type of short wave variometers.

The theoretical action of this circuit can be briefly surveyed as follows. The incoming signal impinging on the antenna is tuned in through the circuit composed of the condenser C-1 and the variometer V-1. The signal current flowing in the tuned circuit produces a voltage drop across V-1 which is picked off by the filament-grid circuit of the detector tube for detection or rectification. The grid leak and grid leak condenser H help to make the tube action correct and greatly aid detection. Energy is fed back to the tuning circuit by means of the variometer V-2 in the plate circuit and the circuit composed of the coil F and the condenser C-2. This backward transfer of energy helps to compensate for the resistance of the tuning circuit and thus causes a large amount of current to flow in if, hence increasing the voltage drop across V-1 and the signal becomes many times stronger than if regeneration is not used. The reason for the use of the circuit F and C-2 is that although regeneration is possible by means of two variometers alone still it is almost next to impossible to tune and hold the regenerative point without causing the tube to spill over and oscillate. By this new method we can approach regeneration by means of



Circuit diagram of a very selective and easily controlled receiver.

the variometer V-2 and we can hold or adjust to more critical or super-regeneration by tuning the circuit F and C-2. The core on which F is wound should be about four inches in diameter and should be placed between the two variometers. It should be wound with No. 22 D.C.C. magnet wire and, figuring 20 turns to an inch of tube length, then about four inches of tubing will be needed.

To successfully construct this tuner much experimental or cut and try work must be done. If regeneration is not obtained the variometer connection V-2 should be reversed or the coil F should be turned around the other way. Try reversing each separately and both together and note the results of each trial. You will observe that one particular combination is much superior to all the others. It is far better and more certain to try out your connections in this manner than to rely on any set rule of direction of windings or the like. Then again, you learn far more by trying things out for yourself to a certain extent than by blindly following some set rule of thumb method. But there are some little precautions or tips that will help to make your set just a little better. For instance, the movable plates of the condenser C-1 should be connected to the antennae and the fixed plates to the grid or V-1 side. By so doing you will greatly diminish body capacity in tuning and the circuit will not howl when you touch the condenser dial.

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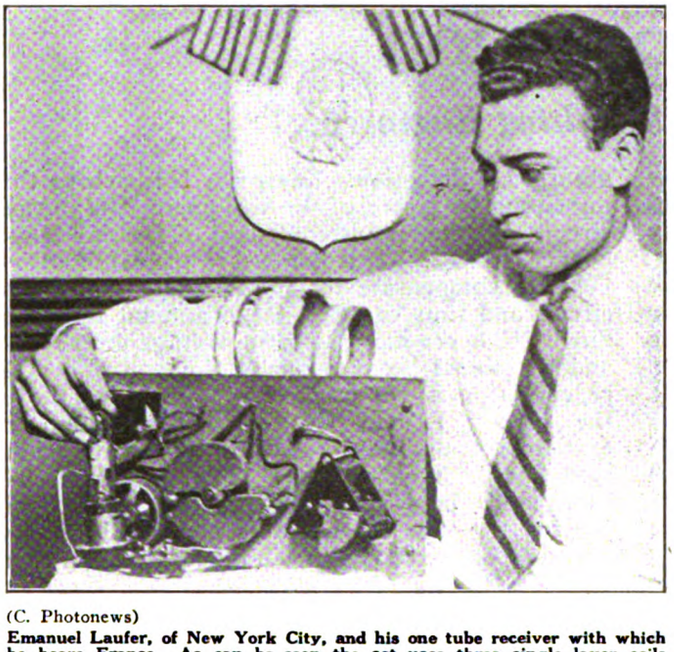
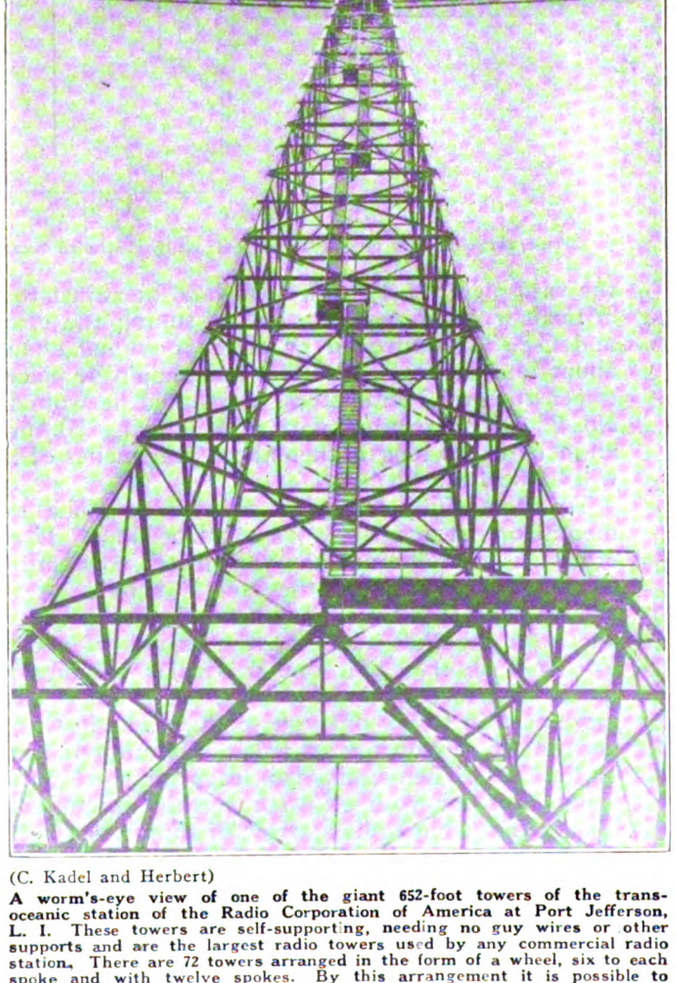
Soldiers, Sets, Sea Views, Soubrettes, Scien for Radio World



(C. Photonews)

Emanuel Laufer, of New York City, and his one tube receiver with which he hears France. As can be seen the set uses three single layer coils as primary, secondary and tickler with all the tuning done by two variable condensers. Laufer was one of the first to pick up the French amateur station 8AB during the tests, and has continually picked him and other foreign amateurs up since that time.



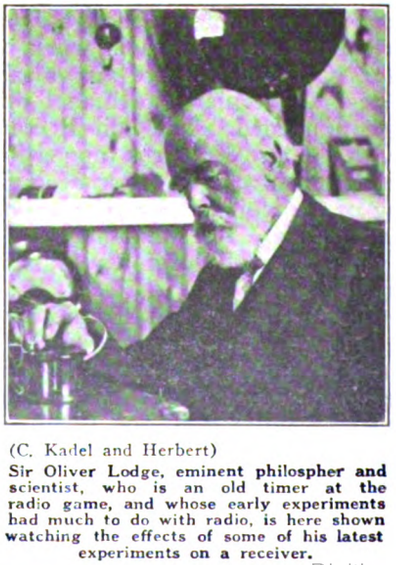
(C. Kadel and Herbert)

A worm's-eye view of one of the giant 652-foot towers of the trans-oceanic station of the Radio Corporation of America at Port Jefferson, L. I. These towers are self-supporting, needing no guy wires or other supports and are the largest radio towers used by any commercial radio station. There are 72 towers arranged in the form of a wheel, six to each spoke and with twelve spokes. By this arrangement it is possible to communicate with radio stations in every corner of the globe simultaneously, due to the directional effect being taken into consideration. Each set of towers has its own transmitters and control, or they can all be hooked together for special work.

The Radio West Point

(C. P. and A. Photos.)

United States Signal Corps experts at Camp Alfred Vail, N. J., experiment with short wa camp is devoted solely to the development of radio experts for the army. There are 115 m Vail studying and experimenting to improve present methods. Just now their energies ar extremely short wave lengths of 15 and 25 meters. This is because the apparatus used for t easily carry the apparatus necessary for transmission and reception over the waves. Note t into very small sections of two feet in lengt



(C. Kadel and Herbert)

Sir Oliver Lodge, eminent philospher and scientist, who is an old timer at the radio game, and whose early experiments had much to do with radio, is here shown watching the effects of some of his latest experiments on a receiver.

Captions by Robert L. Dougherty

(Photograms)

A. Bauer, of the Post ... broadcasting infor... the farmers are ab... interest, such as t... operator shown on the ... outside room. The ca... farr...

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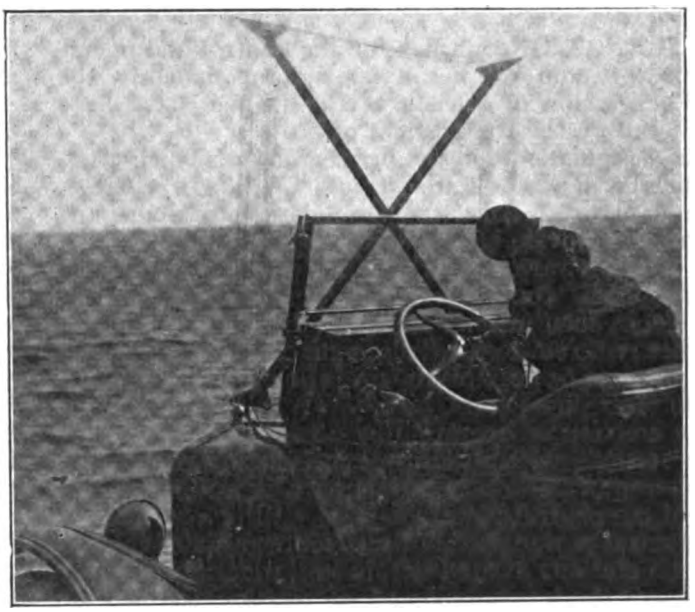
cientists, and Everything Pictured Here orld Readers

Point of the Army

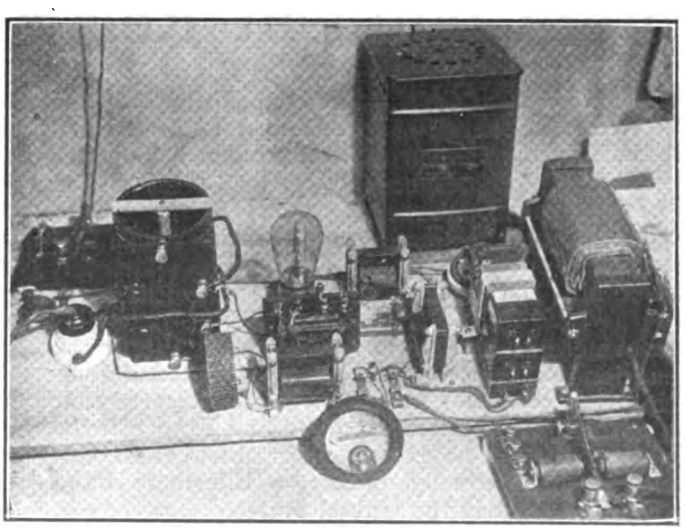
venting with short wave receiving and transmitting over small loops. This y. There are 115 men and officers of the United States Army at Camp w their energies are devoted to transmission and reception over the apparatus used for these waves is extremely portable and two men can these waves. Note the fact that the loop is portable and can be folded of two feet in length.

(C. Fotograms)
C. A. Bauer, of the Post Office Department Radio Station at Washington, D. C., broadcasting information to the farmers. It is through this station that the farmers are able to get all the latest crop prices and news of interest, such as the fighting of various seasonal plagues. The apparatus shown on the table are the receivers, the transmitters being in a separate room. The call of the station is WWX and is listened to by farmers throughout the country,



(C. Kadel and Herbert)
Even "Henry" is not immune from the radio spirit. This radio enthusiast has equipped his Ford with a loop receiver and intends to listen in even when beside the sad, sad sea waves.

(C. Underwood and Underwood)
Rose Parnass, former Follies beauty and her champion bull "Bon-Chonco" being entertained at Rye Beach, N. Y., by their portable loop receiver. The pup must like the program judging by the "pick-up" angle of his ears.



(C. Photonews)
Five watt A. C. Transmitter built by E. Wilbur, a New York amateur. By simply plugging a double wire into the light socket it is possible to operate this set on C. W., I. C. W. or phone. Both filament and plate current are supplied by the transformer on the extreme right.

First Wartime Radio Code Drafted

INTERNATIONAL rules for the control and operation of radio in time of war, as propounded by the Commission of Jurists at the Hague, have been announced by the Department of State.

These regulations, in the preparation of which Capt. Samuel W. Bryant, U. S. N., and Col. Geo. S. Gibbs, U. S. A., assisted American Commissioners Moore and Washburn, provide substantially that:

In time of war the working of non-belligerent radio stations shall continue to be organized, as far as possible, in such manner as not to disturb the services of other radio stations. Belligerent and neutral powers may regulate or prohibit the operation of radio stations within their jurisdiction.

The erection or operation by a belligerent power of radio stations without neutral jurisdiction constitutes a violation of neutrality on his part as well as on the part of the neutral power.

A neutral power need not restrict or prohibit the use of radio stations located within its jurisdiction, except to prevent the transmission of information destined for a belligerent concerning military operations and except as further prescribed. All restrictive or prohibitive measures taken by a neutral power shall be applied impartially by it to the belligerents.

Belligerent mobile radio stations within a neutral state must abstain from all use of their radio apparatus. Neutral governments are bound to prevent such use.

The transmission by radio by a vessel or an aircraft, whether enemy or neutral, when on or over the high seas, of military intelligence for the immediate use of a belligerent is deemed a hostile act and will render the vessel or aircraft liable to be fired upon. A neutral vessel or neutral aircraft which transmits, when on or over the high seas, information destined for a belligerent concerning military operations shall be liable to capture. The Prize Court may condemn the vessel or aircraft, if it considers that the circumstances justify condemnation. Liability to capture of a neutral vessel or aircraft on account of the acts referred to is not extinguished by the conclusion of the voyage or flight on which the vessel or aircraft was engaged at the time, but shall subsist for a period of one year after the act complained of.

In case a belligerent commanding officer considers that the success of the operation in which he is engaged may be prejudiced by the presence of vessels or aircraft equipped with radio installations in the immediate vicinity of his armed forces or by the use of such installations therein, he may order neutral vessels or neutral aircraft on or over the high seas; to alter their course to prevent their approaching the armed forces under his command; or not to make use of their radio transmitting apparatus while in the immediate vicinity of such forces.

A neutral vessel or aircraft, which does not conform to such direction, exposes itself to the risk of being fired upon. It will also be liable to capture, and may be condemned by the Prize Court.

Neutral mobile radio stations shall refrain from keeping any record of radio messages received from belligerent military radio stations, unless such messages are addressed to themselves. Violation of this rule will justify the removal by the belligerent of the records of such intercepted messages.

Belligerents are under obligations to comply with the provisions of international conventions in regard to distress signals and distress messages so far as their military operations permit. Nothing in these rules shall be understood to relieve a belligerent from such obligation or to prohibit the transmission of distress signals, distress messages and messages which are indispensable to the safety of navigation. The perversion of radio distress signals and distress messages prescribed by international conventions to other than their normal and legitimate purposes constitutes a violation of the laws of war and renders the perpetrator personally responsible under international law.

Acts not otherwise constituting espionage are not espionage by reason of their involving violation of these rules. Radio operators incur no personal responsibility from the mere fact of carrying out the orders which they receive in the performance of their duties as operators.

Inter-Continent Relay by North Pole Radio

HARTFORD, CONN.—The expedition to the Arctic in charge of Dr. Donald B. MacMillan will keep in touch with all civilized countries in the Northern Hemisphere by radio. This is the belief of Kenneth B. Warner, secretary of the American Relay League, the amateur organization which furnished a radio operator for the polar party which left Wiscasset, Me., last week on their voyage to Ellesmere Land.

So convinced is he that messages from WNP, the radio station on MacMillan's schooner, will reach amateurs in other countries beside the United States that he has notified amateurs in England and France to be on the alert. He estimates that either one of these two countries is about equally distant to Ellesmere Land as the average point in the United States.

He has pointed out that the distance between Ellesmere Land and England is far less than the distance between the Middle West and England, which was covered many times during the amateur Trans-Atlantic tests of last year. At this time the amateur station operated by Irving Vermilya, New Bedford, Mass., succeeded in sending fourteen complete messages to an amateur in England.

The failure to establish direct two-way communication between American amateurs and those in England and France may now resolve itself into an intercontinent relay by way of the North Pole. For example, messages from amateurs in this country may be sent to Donald H. Mix, operator on MacMillan's ship, and relayed by him to amateurs in any of the Northern European countries. Similarly amateurs across the Atlantic can relay through the station in the far North.

Already Mr. Vermilya and other American amateurs, whose records have been the envy of all operators, are getting their sets in readiness to communicate with members of the exploring party and are looking forward to what may be the most spectacular radio feat which has yet been attempted.

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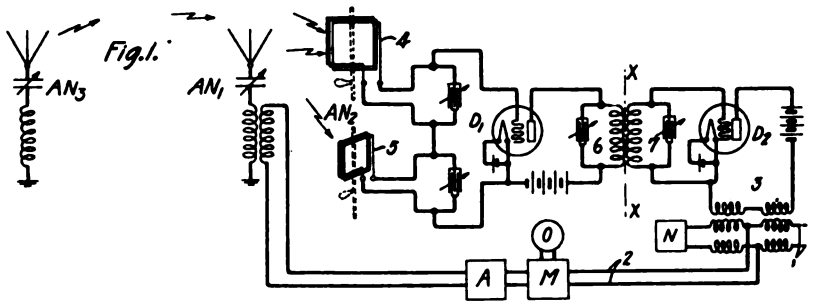
Latest Radio Patents

Radio Receiving Circuits

No. 1,457,447: Patented June 5, 1923. Patentee: John Mills, Wyoming, N. J.

THIS invention relates to radio-receiving circuits, and particularly to that type employing the principle of successive detection.

The term "successive detection" as here used is given its usual signification as involving the function of stepping down the frequency of the received radio-frequency waves to an intermediate high frequency by one detecting operation and employing a subsequent detecting operation to obtain the low frequency modulating component. According to the present invention the wave to be received and an auxiliary radio wave are received and impressed together upon the input circuit of the first detector, by which the first frequency reduction is accomplished. The auxiliary wave is given such a frequency that, by combination with the normally received wave, there will result in the output circuit of said detector an intermediate frequency wave having a desired periodicity. The auxiliary wave source may have its sole function as above indicated or it may combine this function with that of a source for transmitting waves to the distant station, the circuits associated with said source and the receiving circuits constituting the terminal circuits of a complete two-way channel. A system characterized generally by the production of intermediate frequency waves at the receiver will be designated an "intermediate frequency system," the specific type in which the auxiliary wave source has a double function, as described, being correspondingly designated a "modified intermediate frequency system." A receiving circuit having means for stepping down the frequency of its normally received wave by combination with an auxiliary frequency wave, whether said auxiliary wave has the additional function mentioned or not, will be designated an "intermediate frequency receiving circuit." The auxiliary frequency source will be designated as a "local" source, and its circuit as the "local transmitting circuit."



John Mills' system of alleviating interference by means of intertuned receivers.

The principal object of the present invention is to provide a means whereby, in an intermediate frequency receiving circuit, a regular amount of auxiliary radio carrier wave may be impressed on the input circuit of the first detector without detriment to reception from the distant station.

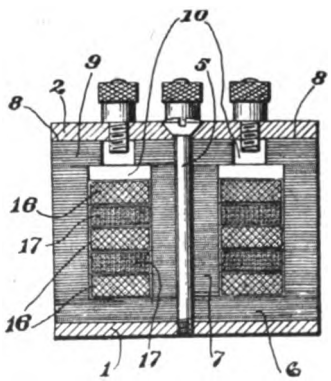
Audio-Frequency Coupling Transformer

No. 1,457,619: Patented June 5, 1923. Patentee: Samuel Cohen, Brooklyn, N. Y.

THE main object of this invention is to provide an efficient audio-frequency transformer of superior utility and applicability to transformers similarly used in radio electrical arts.

The essential points in obtaining an efficient audio-frequency coupling transformer are, briefly, the following: The ratio of the reactance to the resistance should be a maximum; the ratio of number of turns in the primary winding to the number of turns in the secondary winding should be a maximum; the degree of coupling between the primary and secondary windings should be a maximum; the leakage reactance of the core and windings should be a minimum; no external magnetic field should exist when the transformer is in operation in order to prevent stray fields from producing coupling between transformers and neighboring electrical apparatus and thereby preventing the generation of electromotive forces of audio-frequency; the coupling transformer in toto should have minimum physical dimensions.

It is the aim of this invention to accomplish the above-mentioned design and arrangement in a practical manner and yet approaching theoretical perfection as near as possible.



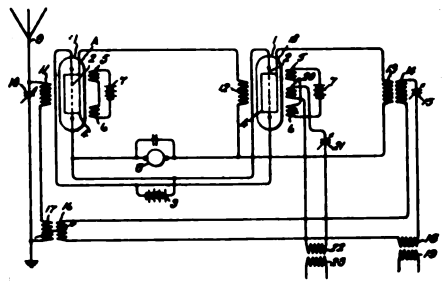
New method of transformer construction, using several sectional windings for primary and secondary, allowing maximum coupling.

To many anxious inquirers: RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Amplifier

No. 1,457,814: Patented June 5, 1923. Patentee: Howard L. Becker, Schenectady, N. Y.

THE present invention relates to amplifiers of the electron discharge type, and more particularly to magnetically controlled amplifiers. One of the objects of the invention is to provide a simple and efficient circuit connection of magnetically controlled amplifiers whereby a high degree of amplification may be obtained. A more specific object of the invention is to provide an amplifying system in which successive amplification of small currents may be produced in a single device.



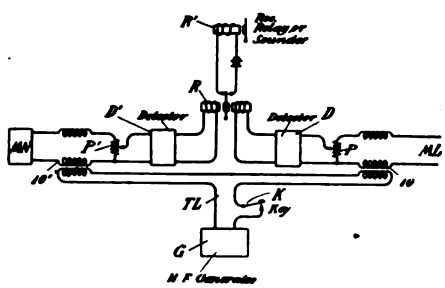
Amplifier providing successive amplification of small currents in a single tube.

Balancing Circuits

No. 1,457,336: Patented June 5, 1923. Patentee: Herman A. Affel, Brooklyn, N. Y.

THIS invention relates to signaling circuits, and more particularly to arrangements for translating low frequency signals into higher frequency carrier currents and vice versa.

In multiplex transmission systems employing carrier currents it is customary to separate the east and west channels of a carrier transmission circuit in a manner similar to that employed in the case of the so-called 22 type telephone repeaters. A circuit of this type involves balancing the carrier frequencies by means of an artificial line for simulating the main transmission line at the carrier frequencies. A low frequency balance is usually also provided in connection with the terminal signaling circuit to maintain the oppositely directed channels conjugate at low frequency. The translation of the ordinary signaling frequencies into carrier frequencies and vice versa is carried out independently of the balancing circuit. In accordance with the present invention the frequency translation is made an integral part of the balancing circuit by locating the translating device, which may be either a modulator or demodulator, in the circuit on either side of the point of neutralization between the real and artificial line. Consequently the energy of an outgoing transmission, for instance, which it is desired to balance with reference to the receiving channel, undergoes a change in frequency before the balance is effected. An arrangement of this character renders it possible to balance the circuit without maintaining a high degree of balance in the artificial line or network for both high frequency phase and magnitude.



Means of balancing both sides of a carrier wave in transmission.

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Answers to Readers of Radio World

IN relation to loading sets for higher wave lengths, how is it possible to load the Flewelling super circuit for higher waves? Can they be loaded for waves up to 25,000 meters? Is it possible to load a 4-tube reflex circuit up to that wave?—H. R. Loring, General Delivery, Bellaire, Ohio.

You cannot efficiently load a circuit of the Flewelling type up to that high wave length. It is not necessary for you to use a circuit of this type to reach the high wave lengths. To do it right you should use the three-circuit, honeycomb circuit, whereby you can easily reach the high waves, and get POZ and FL, and all the other high-power stations on one tube. These stations are of such extremely high power that it is not necessary to even use a tube; but, by means of a tickler, or slipping contact wheel, in the detector circuit, they can be reached by a crystal detector, using the double-circuit crystal hook-up with the larger honeycombs.

If you desire to load a reflex circuit it will be necessary for you to get special radio-frequency transformers that encompass this band of wave lengths. They are not generally manufactured, so it will be necessary for you to have them made to order; but no advantage would be gained by their use, as then only the extremely long wave lengths of from about 15,000 to 25,000 meters could be received.

* * *

I have made up the Cockaday circuit recently described in RADIO WORLD *by R. P. May, and am in trouble in the following manner: When I leave the phone condenser off my set squeals and the signals are muffled, and when the condenser is in the signals are clear but weak. The tuning is sharp, but I can only get each station at a definite setting of the dials. A definite setting has to be used for each separate station. The set does not seem to be regenerative at all, and I wonder if reversing the B coil might be the cause. I have been using WD-11 tubes, with 22½ volts on the plate.—B. R. White, 641 Washington Avenue, New York City.*

One of the features of this set is the regeneration without any of the effects, such as re-radiation of signals. The fact that you are using the WD-11 tubes would account for the weak signals, as this set does not operate successfully on the dry-cell tubes. Better results can be had if it is worked with the U. V. tubes. Reverse your B coil, as suggested and shown in the diagram. If this coil does not run in the same direction as the other coils the coils oppose each other, and that will cause the trouble you mention.

* * *

I have recently built a Stockleburg Pup Set and have obtained wonderful results. I have trouble, however, with body capacity, and have to operate it very carefully, otherwise the set howls like a "pup." Would placing the honeycomb coil in the position shown be of any help in removing this? Should the copper foil ground be grounded? Where? Would better results be obtained if the variable condenser was removed from the front of the panel by placing wooden blocks between the condenser and the panel? Should the leads be insulated by spaghetti or rubber tubing? Would lining the cabinet with copper foil be of any benefit in removing the body capacity effect?—J. L. McNabb, 826 Ann Street, Columbus, Ohio.

Placing the coil in the position shown in the sketch you send would probably help it a little. You should ground the panel shielding to the ground post of the set. It would probably help if the condenser is mounted as suggested, but in that case a non-metallic rod would have to be used to manipulate it, as otherwise the mounting would not have any effect as the use of a metal rod would carry the body capacity to the set through the metal just the same as if you did not mount it in the manner described. It is not absolutely necessary to insulate the leads except where they cross at extremely close quarters, and in that case they should be insulated. Lining the cabinet in the manner suggested would obviously help in the elimination of the disturbing capacity effect. In this case the entire cabinet should be grounded, but take extreme care that no part of it touches the shielding.

* * *

In RADIO WORLD *for April 21 you describe a double-control switch in connection with a circuit by Arthur Gordon. I note that the negative B battery is connected to the negative A lead, and have had my connection on the positive A lead. Which is correct?—E. V. R. Harris, Woodstock, N. B., Canada.*

The circuit will work either way. Better results are sometimes had with the connection you mention, but it is a matter of experiment, and can easily be determined which works best by simply shifting the leads of your A battery.

* * *

In connection with the combined transmitting and receiving circuit published in RADIO WORLD *for May 19, what is the capacity of the grid leak? Would better results be had by the use of a power tube in this circuit?—William T. Deasy, 74 Quericus Avenue, Willimantic, Conn.*

The grid leak should be 1-5 megohms resistance. A variable one will suit the purpose. You can use a power tube with this circuit if you wish. This will allow you to use more power in your plate circuit and consequently reach further.

* * *

I constructed the Cockaday receiver according to your description and circuit diagram in RADIO WORLD *for May 12, but find that I cannot get anything but a dull hum or click. This is more pronounced when I turn the tube off. Could this be caused by using a faulty socket?—Herman C. Menes, 4 Otisfield Street, Roxbury, Mass.*

The fact that you get a dull hum or buzz in your circuit is an indication that you have a break somewhere in the circuit. This could be caused by a faulty socket, the prongs making poor contact with the nipples of the tube. Go over your circuit very carefully, testing out each connection, to see if there is not a faulty contact. Examine all your movable contacts, such as tap leads, and you will probably find your trouble.

* * *

Is the enclosed circuit a good one? Will a tube detector be more efficient than a crystal detector? Is it possible to use two variometers, coupler, etc., with this circuit instead of the loop and condensers? Where can I purchase resistances of 500 to 2,000 ohms?—E. L. Mason, Essex, N. Y.

The circuit you enclose is the reflex circuit used in the De Forest D7 set. It is possible to use a tube detector with this circuit, but better and clearer reception will be had if the crystal is used. The tube will add but little to the operating sensitivity of the set, and the signals will most probably be much distorted when it is used. Stick to the diagram. You cannot combine this set with a variometer and coupler, though you can use a coupler as a tuner with an antenna and ground, but the variometers are useless in this circuit. Write to any of the radio supply houses advertising in RADIO WORLD.

* * *

Kindly publish a correct circuit diagram of the De Forest D7 loop set. In RADIO WORLD *for June 2 you published a ship receiver using the Grimes inverse duplex reflex receiver. Can I use U. V.-200 tubes with this receiver? Can I use dry-cell tubes? Is it advisable to use a three-stage amplifier in connection with the De Forest? They are to use dry cells.—Walter H. Spieler, 19 Mystic Avenue, Somerville, Mass.*

For the De Forest reflex we refer you to the Answers to Readers column in our issue for June 23, where you will find the circuit requested. It is not desirable to use U. V.-200 tubes with this circuit as the tubes have to perform the work of amplifiers. The last or detector tube can be a soft tube, but otherwise use the amplifying tubes. It is possible to use the dry-cell tubes with this circuit, but results will not be as good when these tubes are used as when the regular large plate surface tube is employed.

There should be no need for adding more amplification to a set of the De Forest type. You will obtain three steps of radio and two of audio-frequency amplification with such an outfit, which is all that is necessary. More than this will distort the signals, and the added expense is not warranted. More than two steps of audio-frequency or three steps at the most tend to rob the signals of their clarity, and you will obtain nothing but a lot of noises.

* * *

Kindly advise me where I can get a diagram of a three-circuit set using two variometers and a coupler in connection with a panel diagram and two stages of audio-frequency. Is it necessary to shield the panel? Does it make any difference if the two variometers are of different makes?—William J. Watt, 104 Commercial Street, Rochester, N. Y.

We refer you to RADIO WORLD for June 30, where you will find the necessary data for the construction and operation of a regenerative set for which you ask. For proper operation the set should be shielded, preferably with copper foil or screening. It should not make much difference if the two variometers do not vary too greatly in size. The smaller one, or the one with the least number of turns, should be put in the grid circuit.

* * *

I constructed the Stockleburg Pup Set described in RADIO WORLD *for May 5, but cannot seem to get any regeneration. Kindly explain why I can only get results when tapping the coil at the eleventh turn.—E. Cutris, P. O. Box 718, City Hall Station, New York City.*

You should tap your coil at the inside of the honeycomb. Start at the inside and count the turns, not the layers, as otherwise you will not get the correct amount of wire in your plate circuit. This accounts for the fact that you have to tap it at the eleventh turn. It will give you plenty of regeneration when tapped right.

* * *

Please send me the correct hook-up for the set described by Orthcrus Gordon that appeared in the January 20 issue of RADIO WORLD.*—C. W. Gildner, Pittsburgh, Pa.*

The hook-up as it appeared is correct.

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Using the MAGNAVOX

IT is the Magnavox owner who gets the utmost service from Radio.

While the Radio enthusiast constantly strives to better his receiving equipment, Magnavox Reproducers and Power Amplifiers are units which no other apparatus can replace.

The only correct principles of sound reproduction and amplification are embodied in Magnavox construction.

Magnavox Reproducers and Power Amplifiers can be used with any receiving set of good quality. Without Magnavox, no receiving set is complete.

Magnavox R2 Reproducer and 2 stage Power Amplifier (as illustrated) **$115.00**

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field **$60.00**

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . **$35.00**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

7R

Helping to Keep the "Stay-at-Homes" happy

RADIO has banished that dull, lonely evening idea once and for all—the "stay-at-home" nowadays can choose his own brand of entertainment from a number of programs practically every hour.

But a Radio set is only as good as its *reproducer* — make sure you have the Magnavox (electro-dynamic) Reproducer Supreme.

Magnavox products can be had of good dealers everywhere. Send for copy of unusual booklet.

The Magnavox Co., Oakland, California
New York: 370 Seventh Avenue

MAGNAVOX Radio
The Reproducer Supreme

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THE RADIO BUSINESS IS GETTING INTO FINE SHAPE. AS FORBES SAYS: "THE BEST STEEL IS THAT WHICH HAS UNDERGONE THE HARDEST POUNDING."

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Burke Hennessy, 30 Fifth Avenue, New Rochelle, N. Y.
H. R. Whaley, 220 North Tod Avenue, Warren, O.
Tom Kolonsh, 607 North Eighteenth Street, Omaha, Neb.
Charles Glatz, 850 Stebbins Avenue, Bronx, N. Y. (Makes sets to order.)
H. Adams, 27 Converse Street, Wakefield, Mass.
A. S. Diehl, Box 154, Lake Arthur, La.
Elden Peterson, P. O. Box 95, Winthrop Harbor, Ill. (Consumer and retailer.)
Frederick James Hellmer, E.E., 6211 Toledo Avenue, Detroit, Mich. (Builds and designs sets.)
J. L. Bostian, 8 Hammond Place, Elmhurst, L. I., N. Y. (In market for home set costing $150 to $200.)
H. B. Helein, 526 Church Street, New Britain, Conn. (Makes radio sets.)
H. D. Burrall, care U. S. Forest Service, Magdalena, New Mexico.
Ervin F. Schubel, R. 2, Lake Beulah, Wis. (Possibly may become a retailer.)
Bernard S. Shay, 3016 Holmes Avenue, South, Minneapolis, Minn. (Will soon open radio store and shop. Wants first-class parts.)
G. A. Fassnacht, 5616 Second Avenue, South, Minneapolis, Minn.
R. O. Lamb, 18 Trenton Avenue, Swissvale Station, Pittsburgh, Pa. (Neighborhood supply dealer.)
J. J. De Back, 38 Arbutis Street, Rochester, N. Y. (Interested in both receiving and transnitting.)
Marks Bros., 2312 Eighth Avenue, New York City. (Dealers.)
F. Elphick, 706 Hudson Avenue, Secaucus, N. J.
Simplex Radio Supply Co., 1806 Lafayette Avenue, St. Louis, Mo. (Wholesale and retail mail-order house.)
R. J. Russell, 5013 Baltimore Avenue, West Philadelphia, Pa.
L. Seltzer, 272 Saratoga Avenue, Brooklyn, N. Y.
Essex Mfg. Co., 117 Mulberry Street, Newark, N. J. (Jobbers and dealers.)
W. A. Wynne, 120 South Salisbury Street, Raleigh, N. C. (Dealer.)
W. F. Kuhn, 2209 South 39th Street, St. Louis, Mo.
Dr. F. M. Cooper, 14 South Weber Street, Colorado Springs, Colo. (Soon be in market for parts for one or two portables.)
Tillman Products Co., 473 Hudson Avenue, Brooklyn, N. Y. (Manufacturers. In market for molded rheostat bases, sockets and crystal detector bases only.)
John Logan, 1955 Morengo Ave., South Pasadena, Calif.
W. Gilbertson, Hickson, North Dakota.
Dean French Taylor, 43 Black Rock Turnpike, Bridgeport, Conn.
L. A. Wallace, Engineer's Office, Beaufort County Road Commission, Washington, North Carolina.
C. W. Thomas, Huntingdon, Quebec, Canada.
Swain Solon, Shenandoah, Iowa. (Dealer.)
Michael Moss, 2275 Morris Ave., Bronx, N. Y.
J. Lawton Ellis, Jr., electrical engineer, Allendale, South Carolina. (Radio service.)
Wm. Messenger, 238 Eighth Ave., N. E., North St. Paul, Minn.
John L. Heath, Box 395, Derby Line, Vermont. (Builds, repairs and installs sets.)
H. B. Phinny, 310 West First Street, Oil City, Pa.
W. H. Burnham, 727 Tremont Street, Boston, Mass.
George Kotz, 5534 Pemberton Street, West Philadelphia, Pa.

The first of these names were printed in Radio World dated April 21, and have continued in each issue since. Any copy 15c. Any 7 copies for $1.00 Radio World, 1493 Broadway, N. Y.

Investigates Broadcasting in England

M. C. RYPINSKI, vice-president of C. Brandes, Inc., and chairman of the radio section of the Associated Manufacturers of Electrical Supplies, returned from Europe last week on the "Homeric."

Before the British Broadcasting Society he explained American broadcasting methods and will shortly give talks in New York, Pittsburgh and Chicago, over radio, on British broadcasting methods.

Mr. Rypinski says that the opportunity to investigate the British broadcasting situation was most helpful and interesting.

The British public have been quick to take the idea, and as this public numbers fifty million or more their interest in radio broadcasting is bound to be fraught with important developments.

M. C. Rypinski, of New York City, who investigated broadcasting in Great Britain

He was also impressed with the unified control over broadcasting vested in the British Broadcasting Company, which is an association of about 500 radio manufacturers (membership open to any bona fide British manufacturer), acting under the supervision of the Postmaster General. This unified control obviates duplication of expense, minimizes interference and should develop a very high standard of broadcasting program and operation.

Radio Trade Opportunities

PROSPECTIVE purchasers of radio equipment in Riviere du Loup, Quebec, Canada, have filed inquiries with the Department of Commerce, Washington, D. C., as to exporters in the United States. The names and full data are available upon application under Trade Opportunity 6888. Other inquiries on radio parts have also been received from London and may be referred to as No. 6908.

No. 6,862 refers to an agency for radio equipment and apparatus desired in Newcastle, Australia.

New Radio and Electric Firms

Electro Company, New York, has increased its capital stock from $4,000,000 to $4,750,000.

Consolidated Telegraph and Electrical Subway Co., New York City, will issue 37,500 shares preferred stock and 442,500 shares common stock, both of no par value.

Ceasar Electric & Radio Corp., New York City, $50,000; P. Dicesare, W. H. Grote. (Attorney, F. S. Marsell, 154 Nassau St.

Albany Radio Corp., Albany, N. Y., has increased its capital stock from $10,000 to $50,000.

Berling Magneto Co., Buffalo, N. Y., $40,000; W. J. Daetsch, W. E. Barrett. (Attorney, N. C. Kropp, Buffalo).

American Broadcasting Corp., New York City, $5,000; C. Tepper, S. H. Gore. (Attorney, I. M. Sackin, 152 West 42d St.)

The Plateau Valley Light & Power Company, Colbran, Colo.; capital stock, $100,000; Clarence L. Fenn, George Bullock and M. R. Groves.

The Cambridge (Ohio) Light & Power Company; capital stock, $75,000; Frank M. Taylor, Robert S. Ashe and Wilfred Jessup.

R. V. English Electrical Co., Buffalo, N. Y.; $10,000; J. M. Mead, R. V. English, E. W. Hartung. (Attorney, H. P. Miller, Buffalo.)

Ambrose Diehl Electric Co., Uniontown, Pa., has increased its capital stock from $150,000 to $275,000.

Sprague Electrical Supply Co., 39 Spring Street, Waterbury, Conn. (Wholesale.)

Arrow Supply Co., 107 North 7th Street, Philadelphia, Pa. (Wholesale.)

W. M. Rosenthal, 726 Atlantic Avenue, Atlantic City, N. J.

Edward S. Peacock, 215 West Washington Street, South Bend, Ind.

Allison Cash Hardware Co., Allison, Ia.

Meredith Hardware Co., 721 West Grand Avenue, Des Moines, Ia.

E. C. Harkness, 1630 North Capital Street, Washington, D. C.

UNITED STATES DISTRICT COURT, SOUTHERN DISTRICT OF NEW YORK:
No. 34404 In Bankruptcy.
C. HYMAN BATNER, Bankrupt.
TO THE CREDITORS OF THE ABOVE NAMED BANKRUPT:

Pursuant to Southern District Rule 22 you are hereby notified that the Receiver, Attorney for Receiver and Petitioning Creditors, and the Appraisers herein, have filed petitions in writing for allowances for services rendered the estate of the above named bankrupt, as follows:

GABRIEL I. LEWIS, receiver's commissions $30.26
Allowance to ARCHIBALD PALMER, attorney for Receiver..... 60.52
Disbursements 1.00
BERNARD J. McCORRY, appraiser.... 10.00
ARTHUR C. SMITH, appraiser..... 10.00
CLIFFORD G. LUDVIGH, appraiser.... 10.00

YOU ARE HEREBY NOTIFIED that the said applications for services rendered said estate, will be brought on for hearing before me as Referee, at my office, No. 2 Rector Street, City of New York, on July 12th, 1923, at 1 P. M., at which meeting the said matter will be heard and such recommendation made as may be just and proper.

SEAMAN MILLER.
Referee in Bankruptcy.
Dated, June 25th, 1923.

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Dry Cell Tubes Increase Portability of Radio Sets

By Gerald McSweeney

A YEAR ago the idea of taking a radio receiving set on one's vacation was usually regarded as very impractical and somewhat inconvenient. The ordinary crystal receiving set was not satisfactory and the tube set was bulky and inconvenient. Now, however, the developments of the past year not only make it possible but advisable to carry a radio set to camp or summer resort.

As a result of the application of the single dry cell battery such as the WD-11 it is now possible to use a vacuum tube set in places remote from storage battery charging facilities such as the isolated farm, the seashore and the summer camp.

There is no limit to the lengths we may now go. The disciple of Izaak Walton can take his outfit with him to some shady nook, and if the fish are not biting well, he can while away the hours listening to the soothing strains of music a la radio from a broadcaster miles distant, or he can take in a lecture on how to fish, or hear a discussion on the fall styles in evening wear, not to mention the baseball scores. The portable transmitter, installed at the camp, will insure that he does not miss the dinner bell.

The canoe, the motor boat, the automobile, and even the motorcycle of the ambitious camper will this summer be equipped with a radio receiver, and no matter where you go, you will be within easy range of one or more broadcasters.

No argument is necessary to convince the reader, well informed on radio matters that the messy 6 volt storage battery is poorly adapted to portable radio sets on account of weight, bulk and the necessity of having to provide frequent charging means. The actual weight reduction is approximately 40 pounds—lesser weights are often the determining factor in the selection of camp equipment.

Most of the interference handicaps usual to cities and congested centers due to steel structures and power lines are dissipated in the great open spaces and with the exception of intense summer static conditions splendid results may be expected due to the high sensitivity of the vacuum tube receiver. Through processes recently developed the Westinghouse WD-11 and WD-12 dry cell tubes has been perfected to the point where if not mistreated its life is in the neighborhood of 1,000 hours.

The characteristics of WD-11 and WD-12 are identical the only difference being WD-11 is equipped with special base for which it requires an adapter for use in standard sockets. WD-11 is equipped with standard base.

In constructing these tubes the tungsten filament is replaced by a platinum filament coated with salts that will allow greater electron omission with less battery capacity—this development has made possible a tube having all the desirable qualities of an untreated tungsten filament tube which can be operated from the power supplied from a common dry battery. The WD tubes are exhausted to an extremely high vacuum and they do not depend on enclosed gas for their detecting properties. They are thus not critical in any adjustment either to filament, current, plate voltage or to the constants of the circuit in which they are used.

Another advantage is that the dry cells necessary to operate the tube can be purchased for about forty cents and they are rarely difficult to procure even in the smallest of villages or country stores. Therefore, if your power runs out it is very easy, cheap and convenient to replenish.

The farmer now can enjoy with his suburban and city brother the daily weather, time and market reports as well as the many entertaining and instructing features provided by more than 600 broadcasting stations.

The research laboratories devoted to the radio field have concentrated on broadcasting receiving apparatus in an endeavor to broaden the field of application. It remained for Westinghouse to improve the mechanical features of the dry battery tube set and to make it a commercial success.

The outstanding advantage of the tube set is that it uses the antenna current to control relatively large amounts of energy supplied by a local battery while the crystal set is directly dependent on the received energy. The advantage of a set equipped with WD-11 or WD-12 tubes is its adaptability to a convenient and compact source of energy.

Dubilier's Annual Report

THE Dubilier Condenser and Radio Corporation, New York City, for the year ended April 30, 1923, reports a balance of $63,588, after expenses, taxes, preferred dividends and sinking fund reserve, which is equal to 48 cents a share earned on the 131,000 shares of common stock outstanding. The income statement for the year shows sales of $516,058; operating expenses, taxes, etc., $425,938, and net operating profit, $93,588. The corporation's total surplus stands at $73,588.

The Accuratune Micrometer Control Dial

A NEW micrometer control dial manufactured by the Mydar Radio Company, Newark, N. J., embodies several novel and helpful features that will prove of advantage to the owner of a set who desires fine tuning. The dial proper is of aluminum-finished brass with an extra large knob for coarse tuning. On top of this larger knob there is a smaller one. By an ingenious arrangement of gears located inside the larger knob it is possible to get extremely fine tuning, as one complete turn of the micrometer control only moves the dial a hair line, and it is therefore possible to get an adjustment that is impossible by the usual methods. This will prove to be a great help in a set that needs fine controls, and, inasmuch as it is handsomely engraved and constructed, should be a welcome addition to any set.

Will a *Reliable* Wholesaler Please Reply

Editor, RADIO WORLD: We carry a general side line of radio supplies, we are buying and selling for cash, but so far have not found a reliable wholesaler that does business in a regular, dependable manner. They either ask prices that are too high or the product is poor. Can you suggest a way to overcome this condition?

Where can we obtain a list of reliable *wholesalers only?* We would be thankful to you for the above solutions.

JOS. C. HEINTZ.
12 Sixth Street, New Dorp, N. Y.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

Broadcasting Post Cards

THE Pacific Screw Company, 645 N. E. 53rd Street, Portland, Oregon, dealers in radio supplies, have prepared two postal cards for use in acknowledging receipt of broadcasts and for replies to enable receiving stations to know what their outfits are picking up. The forms adopted seem to fulfill the purposes intended. The cards are supplied by the dozen or in quantities.

Radio Improvements in Mexico

THE Mexican Government intends to change the apparatus used in its wireless stations from spark to continuous wave, according to information reaching the Department of Commerce. With the present spark sets, it is reported that the Mexican stations can communicate only with two European stations; one at Nauen, Germany, and the other Lafayette, at Bordeaux, France. Equipment for four modern transmission stations of continuous-wave type have been ordered from Germany at a cost of $200,000. They will be installed at Mexico City, Merida, Vera Cruz and Tampico. The old spark stations will be transferred to the Islas Marias; LaPaz, Lower California; Guadalajara, Jalisco, and Acapulco, Guerro.

Radio Committee of Supply Jobbers' Association Reports

AT a general meeting of the Electrical Supply Jobbers' Association, held at Hot Springs last month, the following recommendations were presented by the Radio Committee and unanimously adopted by the association:

That manufacturers of radio material supply their distributors with standard size 8½ by 10 inch price and data sheets.

That defective tubes and radio material returned to manufacturers, where such returns are permitted, be credited rather than replaced, in the interest of economy, by the elimination of handling small shipments, as in most cases the distributor has already made replacement or adjustment with the dealer.

That all portions of inside of instruments depending on the strength of panel for support be reinforced by extra individual support of such unit so mounted to prevent breakage by rough handling.

That manufacturers pack and ship receiving sets in individual cartons or crates of sufficient strength to permit reshipment in original package.

That all manufacturers of receiving sets of a value of $25 or over supply these sets with a serial number to facilitate the tracing of lost or stolen sets, and that the serial number and catalog number appear on the outside of the container, where it will appear to the best advantage in stocking on distributors' and dealers' shelves, and further recommends that manufacturer, distributor and dealer use serial numbers on their invoices.

That the present practice of allotting radio material on which the demand exceeds the supply be changed to conform to the practice of manufacturers of other lines handled by distributors, thereby rewarding distributors who create business and placing supplies where the demand is most urgent.

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KELLY WAVE SUSTAINING COIL

Eliminates Aerials, Loops and Danger from Lightning

Fit Inside Set

The Kelly Wave Sustaining Coil will work perfectly in any tube set. The coil being sealed under a vacuum, it eliminates STATIC and all interferences.

Price $4 Each

Makes It Portable

Simple to connect. One lead to terminal marked aerial, the other to A or B battery—That's all.

Dealers, write for special terms.

Manufactured by

JOS. GELB COMPANY, 250-258 West 54th Street, New York

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it. Buy your "B" Batteries direct from Manufacturer. No old stock batteries, but fresh tested batteries, with a 100 per cent. efficiency, at the following low prices, which are 50% less than list price.

	Large	Medium	Small
22½ Volt plain	$1.25	$1.00	$0.70
22½ Volt variable	$1.38	$1.13	$0.75
45 Volt plain	$2.50	$1.75	—
45 Volt variable	$2.75	$2.00	—

Any other type of battery made to order. Send Money Order or Order for C.O.D.

ROSENDAL & CO., 2 Stone Street, New York

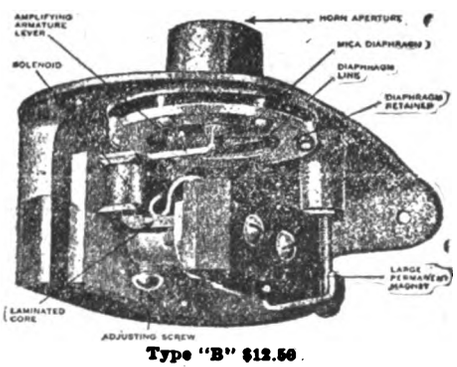
The Trinity Loud Speaker

TYPE "A1"

$25.00

21-in. Fiber Horn

The only device of its kind in the Radio field



Type "B" $12.50

Study the illustration carefully and you will understand why it produces full, clear, natural tones with perfect reproduction of all vocal and instrumental music. May be used with phonograph. No storage battery required.

The Trinity Loud Speaker is an instrument that combines the best qualities of a phonograph reproducer in combination with electro magnetic principles best fitted for radio amplification. Absolutely perfect reproduction of all music and speech without distortion. The volume may be regulated from that required for a room in your home to a tremendous output that can be heard hundreds of feet out of doors by simply increasing "B" battery voltage. No storage batteries required. The instrument is of a heavy duty type and is guaranteed fully by the manufacturers.

Ask your dealer for demonstration—if he cannot we can.

TRINITY RADIO CORP.

168-"B" DARTMOUTH STREET BOSTON, MASS.

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RADIO WORLD

RADIO WORLD 1493 *Broadway, New York City*

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SUBSCRIPTION RATES:
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Three Months 1.50
Six Months 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year to Foreign Postage; 50c for Canadian Postage.

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Milwaukee Radio Amateur's Club

MUCH interest in the Zenith receptor has been aroused among members of the Milwaukee Radio Amateurs' Club, Inc. Several have built models according to the specifications given before a recent club meeting by R. H. G. Mathews, 9ZN, engineer of the Chicago Radio Laboratory, and have reported favorably on the receiver's merits. Among these were E. T. Howell, Sc.M., vice-president, and the club's recently appointed assistant treasurer; F. W. Catel, 9DTK, some time an operator for the now defunct United Wireless Telegraph Company.

A good share of one of the season's last meetings was taken up with a discussion of the super-heterdyne receptor, with E. T. Howell, 9CVI, and H. F. Wareing, pre-war 9AEX and president, leading.

At the final meeting for the season of 1922-23 Business Manager L. S. Hillegas-Baird read Dr. D. B. McMillan's parting message to A. R. R. L. members. This statement was prepared by Dr. McMillan shortly before he left for the Arctic regions, taking an A. R. R. L. member and radio operator with him.

Regular weekly meetings on Thursday evenings will be resumed by the society about the middle of September. The club's directors and officers will hold several midsummer meetings, at which plans will be formed for the fall membership campaign. A society consisting of 100 per cent of the local radio amateurs and members of the American Radio Relay League, Inc., is the goal to be set in the membership drive. The club's office, to which all general correspondence should be addressed, is 601 Enterprise Building, Milwaukee, Wis.

Broadcasting in 1874

RADIO broadcasting is a development of the past three years but the broadcasting of music goes back a great many years. George S. Pierson, a consulting engineer of Kalamazoo, Mich., writing to WGY, the Schenectady, N. Y., station of the General Electric Company, acknowledging his enjoyment of many programs, tells of a broadcasting stunt enacted by the students of Union College on a frosty March night in 1874.

The generator, he explains, was what is commonly known as a horse fiddle, a great wooden box on the main floor of a circular building, now the library, then in course of construction and roofless. The top boards of the box were well resined and a plank 38 feet long used as the fiddle bow was also resined. With six men standing on the plank, the bow was drawn back and forth across the edges of the box. No one in Schenectady slept that night and the terrifying notes of the mammoth fiddle were heard five miles away.

Mr. Pierson also describes, as a parallel to the progress of radio, a demonstration of the telephone which was made in 1874 in a Schenectady church. An admission fee was charged. A telephone line was strung from pulpit to gallery. The audience was invited to listen into the wonderful invention, but, according to Mr. Pierson, no two people were able to agree on what was said over the wire.

Station WDT Reopens in New Quarters

Station WDT is now located in new quarters at 510 West Twenty-third Street, New York City, under the direction of Vaughn De Leath. This broadcasting station is operated by the Ship Owners' Radio Service, Inc., and the Premier Grand Piano Corporation. It is planned to produce WDT programs of unusual merit

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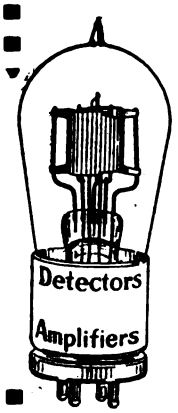
Knock Down Loop Aerial, Complete	1.45

Money Order or Check Must Accompany Order

J. J. KELLEHER

"The Radio Man on the Square"

14 Union Square N. Y. City



GUARANTEED REPAIRS

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VACUUM TUBES

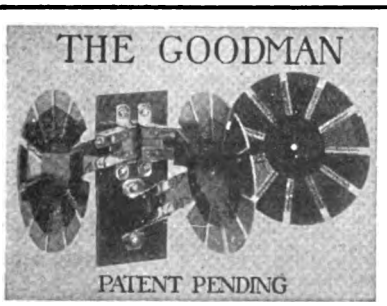
W.D.-11 not accepted for repair

Your dealer should know, but if he does not, send direct to

HARVARD RADIO LABORATORIES

Boston 9, Mass.

Tubes returned parcel post C. O. D.



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RADIO WORLD

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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Rubber in Tremendous Demand

TO make the thousands of various rubber articles, the majority of which are essential to public convenience, more than 250,000 tons of crude rubber are required to supply the world market. Since rubber must be taken from certain tropical trees in the form of latex, or sap, which is more than 60 per cent water, it takes 224,000,000 gallons of the milky fluid to produce the tonnage required to supply the rubber manufacturing industry.

The rubber latex or milk is not an emulsion, as is commonly supposed, but a fluid in which are suspended microscopic particles of solid rubber matter. These particles are so numerous and their powers of adhesion are so great that one gallon of the white rubber-tree sap contains enough of the rubber globules to form a minute thread 372 miles long.

On the rubber plantation the tree milk or latex is treated with a dilute acid solution as soon as it is brought in by the tappers. The acid serves to dissolve the properties which hold the rubber particles suspended in the fluid. This brings the rubber to the surface, where it can be skimmed off just as cream is skimmed off milk.

The value of the plantation rubber to the industry has been tremendous. Scientific care of plantations and extensive study of methods for handling the latex have produced a dependable rubber which the manufacturer can study and compound with the assurance of more uniform service results in the product he makes from it.

YOU SAVE 50% OF THE USUAL COST

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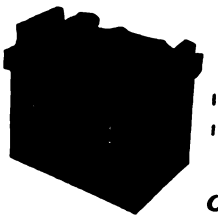

6 Volt 60 Amps.	$10.00
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A Better Battery Cannot Be Built

The best of material—careful construction by skilled mechanics—makes a battery that will give a long life of hard service.

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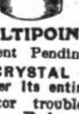

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RADIO PARTS COMPANY

Look Box 56 DUNELLEN, NEW JERSEY

"Leviathan" Establishes Marine Radio Records

In addition to making world speed records during her recent trial trip, the "Leviathan" established three marine radio records for volume of traffic, range of transmission and reception and for operation of duplex telegraph and telephone system. Under the personal supervision of David Sarnoff, vice-president of the Radio Corporation of America, and G. Harold Porter, general superintendent, the radio operators received and transmitted an estimated total of 750,000 words, or 15,000 a day, the greater volume press dispatches. Mr. Sarnoff, himself an expert operator, frequently sat at the key in facilitating the quick transmission of press dispatches.

"On this trip," Mr. Sarnoff said to a New York *Times* correspondent, "there were more messages sent and received daily on the ship than are handled every twenty-four hours between the United States and any one European country. On Saturday, the last day at sea, everything known in radio science was employed to handle the tremendous volume of business, and the transmission was expedited by the use of the duplex simultaneous sending and receiving apparatus so that four operators were working at the same time.

"Due to the position of the ship in tropical waters and the heat wave along the coast, the static was abnormal, in fact during all my experience as an operator prior to becoming an executive I never have listened to static of such force and intensity. As a result, for the first time in the history of marine radio, was it necessary to use the Cape Cod station and divert it from European communications to the 'Leviathan.' The power and wave length of reception was then increased from 2 kilowatts and 1,600 meters to 200 kilowatts and 16,000 meters. The effect of nature-static was thus overcome by the inventive genius of man."

Mr. Sarnoff said that in diverting the European service of the Cape Cod station to another station, the Radio Corporation had placed at the command of the "Leviathan" radio facilities on land costing approximately $2,000,000.

From the first night out of Boston the radio office was swamped with personal, official and press messages. E. N. Pickerill, chief radio officer, and John R. Irwin, Anthony Tamburino and R. J. Green, operators, worked in four-hour shifts at the keys. In the tropical waters, where the static interfered the most and messages were heard indistinctly on land, Mr. Sarnoff directed three stations to listen in. With more than a hundred correspondents on board, the passengers, among them some of the leading business and financial men of the country, yielded to the press on the question of order of despatch.

"We did not have a single kick from the passengers who were informed that their messages would be delayed in order for the correspondents to get their messages to land," Mr. Sarnoff said. "They felt, as I did, that the newspaper men should be given precedence because they were talking to the American public, which naturally was interested in the performance of the ship."

Radio Outlet Moves

THE Radio Manufacturers' Outlet Corporation has removed from 505 Fifth Avenue to 123 Liberty Street, New York City.

Make Your Set The Sensation of Your Town!
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The RADIOXOR

SIMPLE
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Can be attached to any set, operating head phones or loud speaker, crystal or Vacuum Tubes, Loop, Plug or Outdoor Aerial.

Send your name, address and type of set on a post card for details.

Selling like wildfire, so act promptly. Orders filled in order of receipt.

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THE FAMOUS SLEEPER TWINS
THE FIXED COUPLER AT $4.00
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The fixed coupler is the first real improvement in loose or variocouplers in ten years. Looks like the variometer—a wonderful pair.
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Freshman Condenser Leak Mounting
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Furnished in any value of resistance from ½ to 10 Megohms
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At your dealers. Otherwise send purchase price and you will be supplied without further charge.
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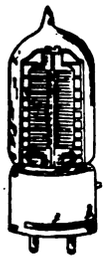

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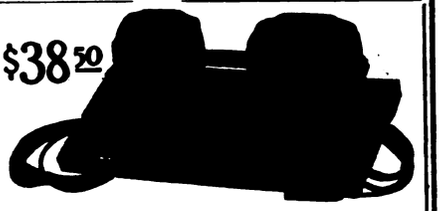

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Motor and generator can be specially wound to charge six cell batteries or other unusual conditions.
Price $38.50 f. o. b. Cleveland. Ship by Express C. O. D., weight sixty pounds. Send your order today and stop paying good money for recharging. Your money back quick if not satisfactory.
NOTE:—If your service is other than 60 cycle, 110 volt, ask for special price.
THE OHIO ELEC. & CONTROLLER CO.
CLEVELAND OHIO

Radio Guild Advises FILKOSTAT

THE Radio Guild of New York announces that after extensive tests it has adopted in its new "Radiolian" Receivers, the Filkostat in place of wire rheostats or other filament controls. The Filkostat has taken the country by storm this summer largely because it eliminates tube noises.

Fifty-two issues for $6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

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Explanation of Radio Time Signals

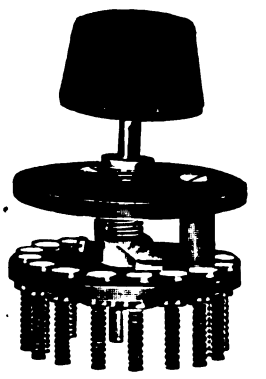
FROM many inquiries received at Station WOC, Davenport, Iowa, it is evident that the average listener does not understand how to make use of the time signal as transmitted at eleven o'clock each day from the Davenport station. The following explanation has been prepared by the director of WOC:

The series of dots which you hear at that time represent the Government time signal received direct from the Naval Observatory at Washington, D. C., by Western Union, and are broadcast for the purpose of giving all listeners the correct time each day.

By observing the following instructions you will be able to make use of this service:

The time signal is transmitted in a series of dots, each dot representing a second. Beginning, usually, at three minutes before eleven o'clock (Central Standard Time), 29 dots are transmitted, representing the first 29 seconds of that particular minute, and the 30th second is omitted; 25 dots are then transmitted, which represent the first 25 seconds of the last half of that particular minute, and the last 5 seconds of the half minute are omitted. The next minute is transmitted in exactly the same way—that is, 29 and skip 1, 25 and skip 5. On the last minute of the hour, the first half minute is sent the same, that is, 29 and skip 1, and the last half minute is sent out 20 dots and the last 10 are omitted, although in some instances you may hear 21 or 22 dots with 8 or 9 omitted, as the case may be. At the end of this 8 or 9-second interval you will hear a long dash, which represents the exact time, eleven o'clock (Central Standard Time). By watching the difference above noted, you can tell when you are listening to the last minute of the hour rather than any of the others.

The code which follows the final dash is simply a station call.



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AETACO Condensers

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23 Plate Condenser	$1.35
17 Plate Condenser	$1.25
11 Plate Condenser	$1.00
3 Plate Condenser	60c.

Two-Tube Portable Set
(Tubes Included)
Consisting of 1 23 P Condenser and Dial, 1 150 to 600 Meter Inductance Coil, 1 6 Ohm Rheostat with Automatic Control for Amplifying Tube, 1 Audio Frequency Amplifying Transformer, 1 Standard Double Socket, 1 Mica Grid Condenser, 1 Tubular Grid Leak and Holder, 1 Detector Tube, 1 Amplifying Tube, 1 Pair Federal Phones, A and B Batteries.
All Connections Automatic, enclosed in 7x7½ Mahogany Finished Cabinet and Formica Panel.
A Very Special Bargain at $30.50
American Radio Stores
235 Fulton Street New York City

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

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Popular Radio at 20c a copy for six months would be..... 1.20
$4.20

or

Radio World for six months.....$3.00
Wireless Age (or Radio) at 25c a copy, for six months..... 1.50
$4.50

Send us remittance for $3.00 and we will send you Radio World for six months and Popular Radio, or Wireless Age, or Radio (San Francisco) for six months, to one or different addresses, or send through your newsdealer.

This offer is good only for one month from date.

Take advantage of this offer today and send in the accompanying subscription blank. If you are already a subscriber you can take advantage of the offer by sending us $3.00 and renewing your subscription for six months beyond your present date of expiration.

Special Combination Offer of Radio World and Popular Radio or Wireless Age or Radio

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Name .....

Street Address .....

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RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

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IF YOU WANT to save and make money, join National Supply Co. and buy anything in hardware line at reduced prices. Write immediately for particulars. Combination Box 254, New Alexandria, Pa.

WANTED—Second-hand radio set. Cheap. Full particulars to A. Browne, 3 W. 104th St., N. Y.

REFLEX FANS—New Reflex uses TUNED radio frequency. Greater selectivity. Better control. Send $1 for plan and specifications. E. F. Nelson, 727 West 8th St., Junction City, Kansas.

FOR SALE—U. S. 3 Bulb Navy Set. Can be seen Room 326, 1493 Broadway, N. Y. C. Will sell at right price to consumer or dealer.

AGENTS, crew managers, $20 daily distributing bamboo self-filling fountain pens; imported; something new; everybody going wild; sample free. SPORS CO., Lesueur Center, Minn.

RADIO MANUFACTURERS—South America is the coming field. Have your catalogs, booklets and bulletins translated into Spanish by a specialist. Submit English originals for estimate. TECHNICAL, Box 126, Trinity Station, New York City.

CRAM'S RADIO BROADCASTING MAP of the UNITED STATES AND CANADA. Scale 100 miles to the inch. In two colors, size 34x28. Printed on high-grade map paper, up-to-the-minute information, indicating all amateur and standard broadcasting stations, with complete index to stations. 35c postpaid. The Columbia Print, 1493 Broadway, New York City.

DYNAMO BUILDING FOR AMATEURS—Or How to Construct a Fifty Watt Dynamo.—By Arthur J. Weed. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings, showing the actual construction of the different parts. Price, $1.00. THE COLUMBIA PRINT, 1493 Broadway, New York City.

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CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

Build your sets with quality parts and get sure results. Radio Parts Co., Box 56, Dunellen, N. J.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

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MAGNAVOX TYPE R3.—Latest curvex, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kans.

TWO FOR THE PRICE OF ONE—Send $3.00 now for six months' subscription (26 numbers) for Radio World during the coming month and we will send you also Popular Radio or Wireless Age or Radio for six months without any extra charge. Or send $6.00 now and we will send you Radio World for one year (52 numbers) and Popular Radio, or Wireless Age or Radio for one year. These offers not good after July 23, 1923. If you are already a subscriber you can take advantage of this offer by renewing from the end of your present subscription. Sub. Department, RADIO WORLD, 1493 Broadway, New York City.

WANTED—Omnigraph in good working condition. Box 435, Hardin, Montana.

RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

HAVE A BRAND NEW RADIO INVENTION that every radio fan needs and will buy, as it greatly adds to the efficiency of his set. Need money to advertise and buy new material. Will you join inventor with some cash and share in the big profits? W. B. GRAHAM, 125 West 74th Street, New York City.

HOOK-UP AND CIRCUIT HOUNDS

Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:

Reinartz circuit for 2 tubes	Jan. 13
Good 2 tube WD-11 Circuit for DX	Jan. 27
Satterlee Circuit	Feb. 3
G. W. May's Wonder Circuit	Feb. 17
Power Amplifier Circuit	Feb. 24
Reflex Circuits	Feb. 24
Flewelling Super Circuit	Feb. 24
Multi-tube Reflex Circuits	March 3
One tube Superregenerative	March 3
Lewis Three Tube Circuit	March 10
Regenerative Radio Frequency Circuit for 5 tubes	March 24
Hazeltine Neutrodyne Receiver	March 31
2VK'S Transmitter circuit	April 21
Compact Universal Receiver	April 28
Stockelburg Pup receiver	May 5
Cockaday receiver	May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Reinartz	May 19

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Do you want to exchange anything for something?
Do you want to buy something?

If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

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Address Circulation Dept., Radio World, 1493 Broadway, New York

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Some Good DX Records

Some Crystal Record—Look Out, You One-Tube Fans

From Guy Simmons, Jr., 515 Clifton Street, Conway, Ark., Radio 5WW.

I HAVE been interested in the DX NITE OWL section for some time, especially in those who use a crystal. I am sending you a list of stations which I have heard in about two months' time.

Station	Distance Miles	Station	Distance Miles
KSD	285	WFAA	300
KLZ	750	WLAJ	370
KFAF	750	WAAP	325
KDKA	800	WPE	310
KLW	550	WHAS	450
WOC	475	WLAG	700
WOS	260	WCAL	670
WHB	310	WMAJ	310
WSB	470	WOAW	475
WGM	470	WBAY	1,070
WBAF	330	WEAF	1,070
WDAF	310	WLW	525
WDAJ	470	WMC	150
WWJ	725	WOAI	550
WCX	725	WAAW	475
WSY	350	WDAP	550
WGY	1,130		
WJZ	1,050	Total	18,880
WWAC	370		

A total of 35 stations.

I attribute all my success to a good aerial and ground and to GOOD connections. Let's hear some more crystal records. Will be glad to correspond with anyone interested in crystal work.

His Second Appearance—A Full-Fledged Owl

From Willis Nye, 310 E. Sonoma Ave., Stockton, Cal.

I'VE appeared in your column once before, and thank you for your recognition and privilege to join the DX Nite Owl fraternity. Here is some fairly good dope. Will try to do better next time.

Local DX—KGO, Los Angeles, Cal.; KJS, Los Angeles, Cal.; KOG, Los Angeles, Cal.; KFCL, Los Angeles, Cal.; KSL, San Francisco, Cal.; KLB, Pasadena, Cal.; KUY, El Monte, Cal.; KDPT, San Diego, Cal.

Medium DX—KMO, Tacoma, Wash.; KDZQ, Denver, Colo.; KDZR, Bellingham, Wash.; KDZL, Ogden, Utah; KFAU, Boise, Idaho; KFAJ, Denver, Colo.; KFDL, Denver, Colo.; KDYS, Great Falls, Mont.; CFAC, Calgary, Canada; KFHR, Seattle, Wash.; KFBL, Everett, Wash.; KDZE, Seattle, Wash.

Real DX—WMAQ, Chicago, Ill.; WOAI, San Antonio, Texas; WDAF, Kansas City. Mo.; WGAQ, Shreveport, La.; WFAY, Independence, Kan.; CFCA, Toronto, Canada.

Also get "oodles" of amateurs on 200 meters. On 800 the commercial stations crash in and rattle my diaphragm. Will answer all cards.

Not Half Bad—? Eh?

From Thornton Higgins, 7313 St. Lawrence Ave., Chicago, Ill.

I AM an interested reader of RADIO WORLD, especially the page devoted to the DX fans.

To date I have heard stations in 26 states and 2 in Canada. The set I am using is homemade, with one step of audio-frequency. The following are the stations heard:

CFCA, KDKA, KFDL, KLZ, KOP, KSD, KYW, WAAF, WAAP, WAAS, WAAW, WAAZ, WBAD, WBAH, WBAP, WBU, WBZ, WCAH, WCAE, WCAS, WDAJ, WDY, WEAB, WEAC, WEAF, WEAJ, WFAA, WFAY, WGAN, WGAK, WGAS, WGF, WGM, WGR, WGY, WHAK, WHAO, WHAS, WHAZ, WHA, WHB, WIAC, WIP, WJAX, WJAZ, WJZ, WLAG, WLAL, WLK, WLW, WMAQ, WMB, WMC, WMU, WNJ, WOAW, WOC, WOR, WOS, WOZ, WPAD, WPA, WQAA, WSAH, WSY. WSB, WTAS, WWAY, WWJ, WIAO. 2XI, 3XW, 9AB, 9AGN, 9BBG, 9BU.

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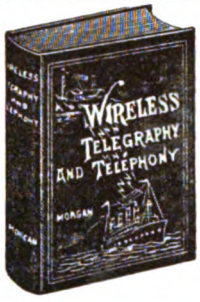

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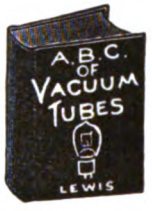

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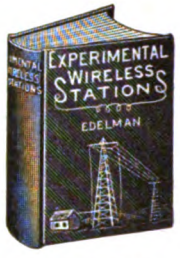

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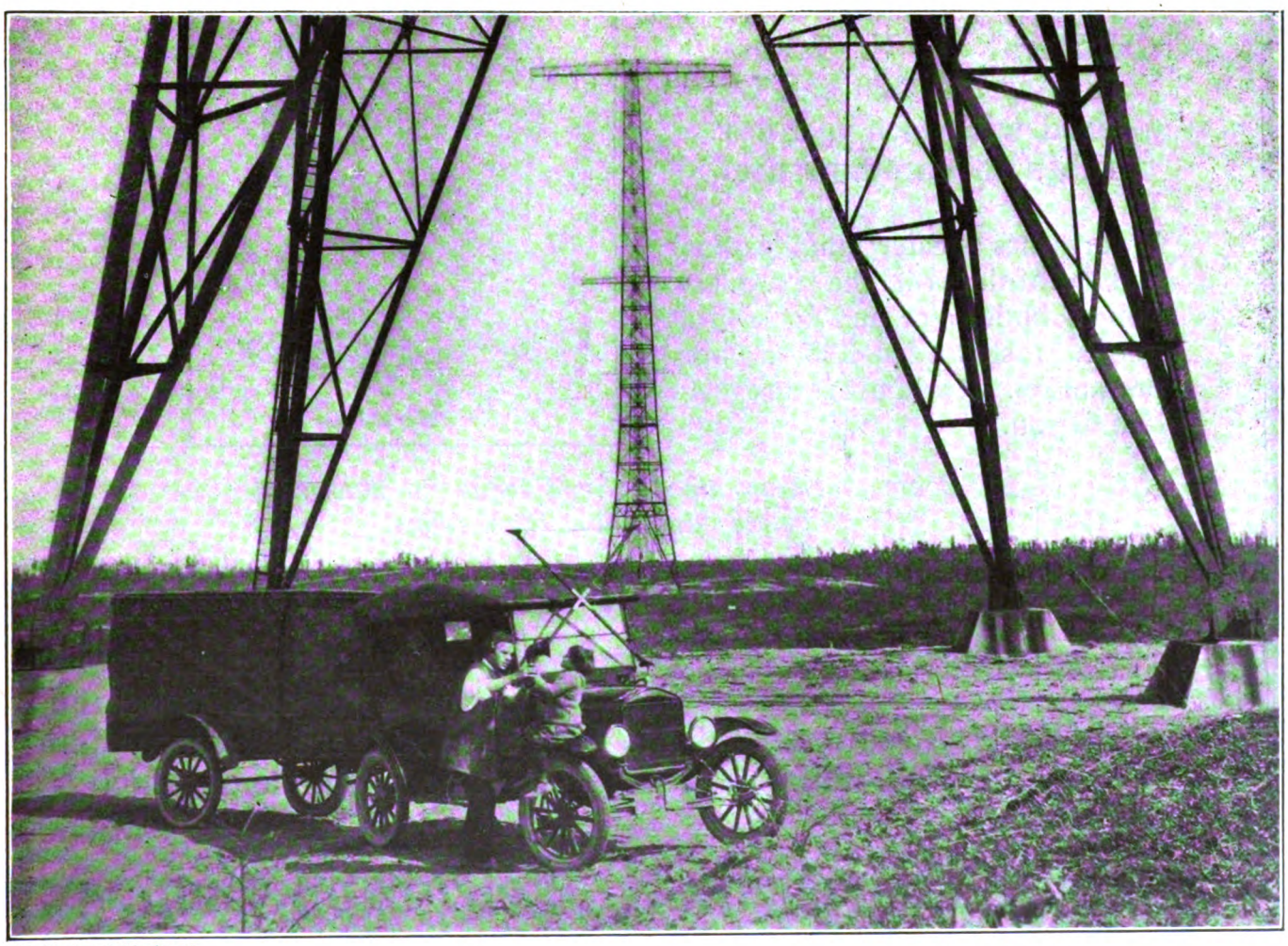

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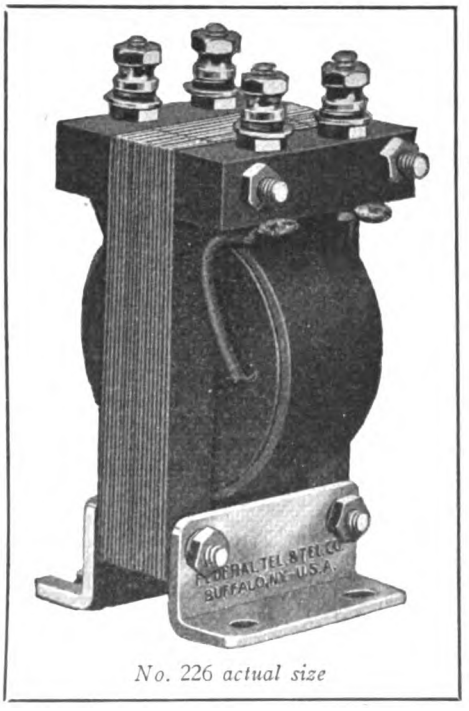

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

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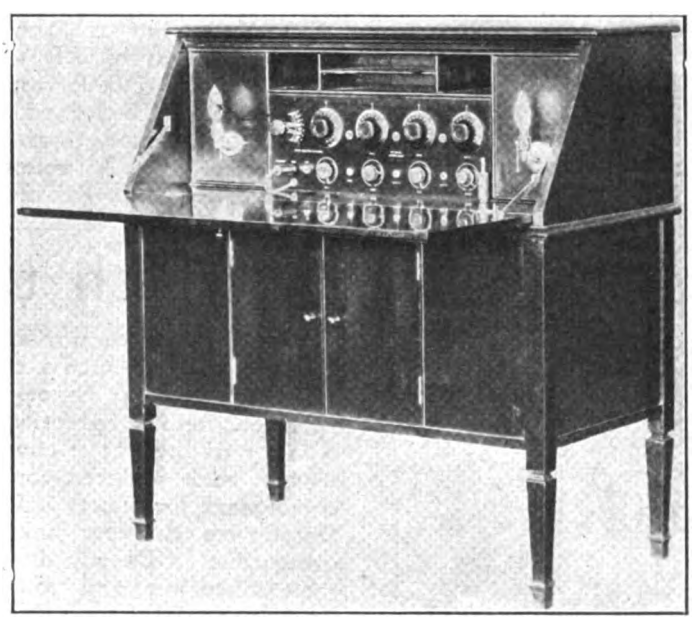
Tuned Radio-Frequency Amplification

By Leon W. Bishop, 1XP

RADIO-FREQUENCY amplification has been the subject of much discussion for ten years, but it is only in the last four years that we have been able to get good results on the shorter wave bands.

Fully 90% of the radio-frequency circuits employ transformers of fixed ratios for a given wave band and in some instances use iron to broaden the range. No matter what method you use to broaden the band with a fixed ratio transformer you still have one narrow band that is favored while the efficiency drops off rapidly on either side. Now that the broadcasting wave band has been widened we must turn to tuned radio-frequency amplification for real results which is the only logical method.

There is no need of a double circuit tuner when several stages of tuned radio-frequency are used and where a slight amount of regeneration is present. In Fig. 1 let the dotted line represent a given wave length and point A the tuning point of the single circuit. Now if the first tube is tuned to this exact point regeneration will occur, but a place on either side of A will be found where no regeneration occurs and the amplification is normal. The point C represents the tuning peak of the second tube and it may be seen that the relative positions of B and C may be reversed so as to minimize interference from local sources. The third stage is shown by D and is not critical of tuning due to the great amount of amplification delivered to it by the first two stages. However, a wide range of selectivity may be obtained by using this stage in connection with the second.



Set employing tuned radio-frequency, as described in the accompanying article, built for Mrs. F. A. Ball, of Athol, Mass., daughter of the late L. S. Starrett, tool manufacturer.

Fig. 2 shows one tuned stage of radio-frequency and detector. The variable condenser C is .0005 mfd. (23 plates). The tuning inductance L consists of 60 turns of No. 22 wire wound on a four-inch tube and tapped every 10 turns. V is a variometer and should be free from shellac on the windings. The success of this circuit depends upon the grid leaks and for that reason it is best to use a variable grid leak. The first grid leak GL is about one megohm, and the second or detector grid leak GL1 is about one-half megohm. The grid condenser C2 is of the mica type and .0005 mfd.

The high vacuum type of tube is best for the radio-frequency circuits while the standard type of detector tube is best adapted for the detector circuit. The B battery for the first radio-frequency tube should be from 45 volts up, and the detector voltage should be that amount recommended by the manufacturer.

The grid leak should be adjusted to the point where only a small path of regeneration occurs when tuning the variometer. A variometer may be used in the plate circuit of the detector tube with increased amplification—also increased tuning troubles.

Fig. 3 shows three tuning stages and detector. The aerial circuit is the same as that described in Fig. 2. The fixed condensers C1 are .001 mfd. and of the mica type. The grid leaks on the first and second tubes should be capable of adjustment as low as 10,000 ohms. A 300 or 400 ohm potentiometer P is connected across the A battery and the negative B battery returned to it. A separate tap is provided for the first stage of RF while the second two stages are connected to the same point on the positive B battery. As much B battery as possible should be used on the radio-frequency tubes up to about 130 volts. The proper amount is determined by trial. The phones should be shunted with a .002 mfd. condenser.

For those interested in power amplification Fig. 4 shows three stages of radio-frequency and two stages of audio-frequency amplification. The radio-frequency part of the circuit is the same as that shown in Fig. 3. The fixed condenser C3 is .002 mfd. The point X should be connected to the negative side of the filament and not to the negative side of the A battery.

Fig. 5 shows a neat and inexpensive charging arrangement for any panel. Care should be taken to use metal covered cable for the AC circuits.

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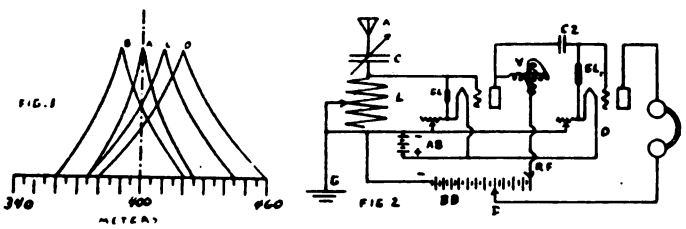
(*Concluded from preceding page*)

Fig. 6 shows an outline of the panel which is 28 x 8 inches for those wishing to follow the design.

The results obtained with this circuit depend upon two points—first, the adjustment of the grid leaks; and second, your knowledge of tuning.

201-A tubes are the best for all of the amplifiers, and may be used for the detector but the old standard detector tube with proper plate voltage seems to give the best results. When distance (DX) is the object the tap on the first RF tube should be lowered but when volume is desired this tap should be moved up on the B battery.

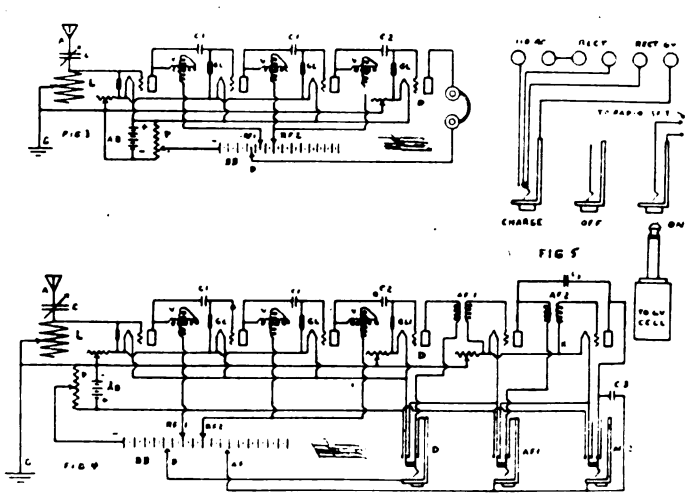


Figs. 1 and 2. Showing the advantage of using tuned radio-frequency and circuit diagram of a two-tube set employing one stage of tuned radio-frequency amplification with tube detector.

The dials should be set to correspond with the variometers; that is, the dial should be at zero when the variometer is at minimum as readings obtained on various stations have a meaning and the same station will always appear at a given point providing the values of the grid leaks have not been changed in the meantime.

As much B battery as possible should be used on all tubes up to about 140 volts for maximum results.

When the circuit is first used regeneration will run wild, but this can be controlled by decreasing the grid leaks. The leak on the second tube is most critical and is always the lowest, sometimes in the order of 10,000 ohms. As the leaks are decreased tuning becomes broader but it is advisable to have a path of regeneration on the first variometer. When regeneration enters into this circuit it comes on with a bang and all signals stop. The greatest signal strength is obtained on either one side or the other of this regenerative point.



Figs. 3, 4 and 5. Sets employing three stages of tuned radio-frequency amplification with detector, and also with two stages of audio-frequency. A neat panel charging device is also illustrated.

Once a rough setting of the grid leaks is obtained the third variometer dial can be set at 75 and the second dial at 40, tuning the first variometer and aerial condenser to a given signal using both hands in the operation. The tuning may be finished up by a final setting of the second and third variometers.

The most active part of the first variometer dial is the first eighth of the dial; the second variometer the middle half and the third is active over the last half. This is a given normal condition but many variations may be tried that are more selective.

Wherein points of regeneration may be found in this type of tuner it must be remembered that it is not classed with the common species of renegerative set that produces untold interference in the neighborhood.

This circuit is taken from old British practice of reactance capacity coupling and remodeled to suit our present broadcasting reception.

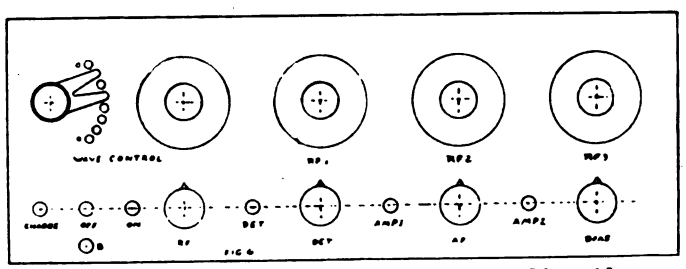


Fig. 6. Panel layout suggested for the sets described herewith.

This circuit is designed for use with a loud speaker on distance reception as well as local. Stations 1,500 to 2,000 miles away may be reproduced in the loud speaker with wonderful volume and no distortion.

Indoor types of aerials may be used with success and loops for local work.

This set greatly reduces interference (QRM) from local stations as well as static (QRN).

The following are the references covered in the diagrams: A aerial, AB A battery, AF audio-frequency, BB B battery, C .0005 variable condenser, C1 .001 fixed condensed, C2 .0005 fixed condenser, C3 .002 fixed condenser, D detector, G ground, GL grid leak, GL1 detector grid leak, L tuning coil, P potentiometer bias, RF radio-frequency, V variometer.

Watch the Details

IN the construction of a receiver the builder is generally in such a rush to get the set made and working that he neglects to think of minor details that help in reception. Do you ever think of the polarity of the phone connections? Do you ever stop to test each soldered connection? Do you test your condensers for shorts before putting them in the set? Do you see that your jacks and plugs are perfect before using them? Do you do a hundred other little things such as brushing and blowing the little filings and chippings out of your condensers and wiring? Think it over, and don't blame the set when you have to hunt for "Old Man Trouble."

A Handy Hint

CONDENSERS like everything else that is subject to much use, occasionally lose their friction control and will not stay set, but slip around. If you attempt to tighten them by the use of the friction screw there is a liability of shorting the plates. If instead, you remove your dial and put a washer of felt or cork between the dial and the panel, fitting it carefully over the shaft, you can get any desired amount of friction—and you won't have to bother with tightening any screws.

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A Crystal Set—Cheap, Compact and Efficient

By Kenneth Malcolm, A. I. R. E.

THE person who lives in the vicinity of a transmitting station can reap the benefits of radio broadcasting without any great outlay of money. The solution of the poor man's radio is found in the crystal set. Of course, the crystal set has its limitations, but it also has advantages that are too often ignored by the present generation of fans, and the popular magazines. But here and now it might be mentioned that the crystal detector is the most efficient detector used, when it is considered that there is absolutely no local or battery current employed in its operation. Crystals are not very sensitive, comparatively, and they are sometimes difficult to keep in adjustment; but notwithstanding this, they afford a simple and effective means of bringing the broadcast concert into the homes of those of moderate means, who cannot consider any great expenditure.

The set to be described can be made at home, with little trouble and small cost, and will operate very efficiently for a set of its type. The writer operated such a set in Brooklyn, N. Y., and brought in all the local stations, including those in New York City and Newark, very distinctly and with considerable volume.

There are not many parts to buy, so it would pay to buy the very best; for the improved results will surely be commensurate. Apart from the set itself, the receivers, or 'phones, are a very important item. Try and get the most sensitive that you can afford.

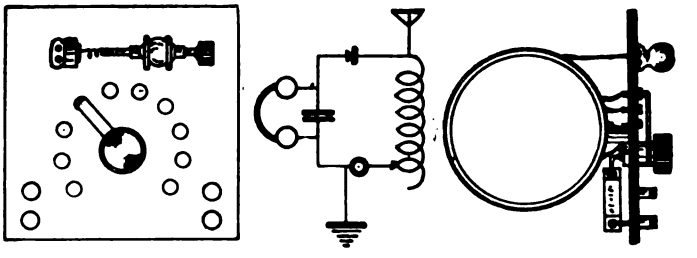
The panel is 5½ inches square and ⅛-inch thick, and of some of the recognized insulating materials. The parts for the detector may be bought at some radio store or supply house, or else they may be detached from the base of a mounted detector. The tube for the tuning coil may be of cardboard that has been impregnated with insulating varnish, vulcanized fibre, hard rubber, or one of the phenol condensation products—preferably the latter; and 3½ inches long and 3½ inches in diameter. About a half pound of No. 24 cotton covered wire is needed for the winding. Procure a small rotary switch of some sort and ten contact points or taps. A fixed condenser of .001 or .002 mfd. capacity is necessary for use across the phone terminals. In buying this it is best to be on the safe side by getting one with a mica dielectric; for the paper dielectric type are in many cases unsatisfactory, on account of their hygroscopic qualities and their changeable capacity, varying with pressure. The difference is not noticed so much, however, in this particular point of operation as in other parts of a circuit. A cabinet, connecting wire, and four binding posts, complete the list of necessary materials.

If your panel has a glossy surface, and you wish a dull finish, it is best to rub it down before mounting the instruments. Some very fine sandpaper, or better still, steel wool, will soon take off all the shine. Do not use a criss-cross or circular movement in rubbing, but rub back and forth in one direction. After the panel has been laid out, and the instrument holes drilled, the final finish of a rich dull lustre may be given by a rubbing with a piece of cotton waste, or an ordinary rag, dipped in machine oil, the superfluous oil being rubbed off with a dry cloth.

Now accurately lay out the panel for the various holes for the switch arm, taps, binding posts and detector. If the panel is to be mounted in a cabinet, holes should also be drilled for the fastening of screws. It might be well to first lay out the different points on a piece of paper of the exact size of the panel; when complete and satisfactory, transferring them direct to the panel. A sharp center punch should be used in marking the points for holes, serving both as a marker and as a guide for the drill tip.

The tube may be mounted to the panel by means of two little brackets made of brass strip, or by means of a small brass tube passed over a long screw, as shown in the drawing; one tube and screw is used on each end of the tuner.

Before being mounted, the tube is given a coat of insulating varnish, and 80 turns of the No. 24 wire is smoothly wound on. There will be about a half-inch left at each end of the winding. Taps are taken from every eight turns. If the wire has been wound tightly enough, the coil will not need another coat of varnish; it is really better without it. Short flexible leads should be soldered to each of tapping points.



Front view of the completed crystal set, circuit diagram and side view, showing the method of fastening the tube to the panel and the arrangement of the leads.

The instruments may now be mounted on the panel. Before the tuner is permanently attached, it is best to solder all the little leads to the switch points. All the other joints should be soldered, also, for every effort should be made to preserve the minute currents that are available in a receiving set. A soldered joint in time means the saving of having to take your set apart nine times in the future.

Except for the tap leads, the connections may be made with rigid wire. No. 14 bare aerial wire is good for this purpose, and ordinary annunciator wire will do in a pinch. If bare wire is used, make sure that there is no possible way for crossing wires to touch and cause a short-circuit; and if a wood box is used, try to keep the bare wires from making a direct contact with the wood.

With a good crystal in the detector, the set is now ready for operation. As a personal preference I would choose galena. For, though it is not always stable, it is very sensitive; that is, providing it is a good piece, for specimens of all crystals vary considerably in their rectifying properties.

The binding posts at the left of the panel are for the aerial and ground connection, and the two posts on the right are for the phones.

The operation of the set consists simply in locating the sensitive spot on the crystal, and moving the switch over the various switch points until the station wanted is obtained.

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Radio Signals of Standard Frequency to Check Wave Meters

THERE is given below a schedule of standard frequency signals to be transmitted from the Bureau of Standards at Washington (station WWV). These signals should be of interest to all station operators who transmit on frequencies above 425 kc as they may be used for checking wavemeters and adjusting transmitting and receiving apparatus. Their accuracy is better than three-tenths of one per cent. Information regarding the use of these signals was given in February, 1923, issue of the Radio Service Bulletin. More detailed information is given in Bureau of Standards Letter Circular No. 92 which may be obtained on application to that bureau.

Commercial and ship stations should be especially interested in the 425, 500, and 600 kc waves. The 425 kc wave is the new frequency assigned by the Department of Commerce for commercial ship traffic. The remainder of the schedule includes the frequencies used by broadcasting and amateur stations. The transmission on the morning of October 7, is especially for amateur stations and includes only frequencies used by them. It will be helpful if amateur operators will stand by while the standard frequency signals are being transmitted on this date, so there will be as little interference as possible with their general reception.

In the schedule below the "general call" is given by voice during the first half of the four minute period and by continuous wave telegraph during the second half; this call is given to enable listeners to tune in WWV. The "standard frequency signals" consist of the station call letters WWV repeated with very long dashes intervening and are transmitted by unmodulated continuous waves. The "announcements" are made by voice during the first half of the period and by CW telegraphy during the latter half. The general call and the announcements are made on the same frequency as the standard frequency signals and may be used for some measurement purposes, but it is recommended that accurate measurements be made on the standard frequency signals only. With highly sensitive receiving apparatus it should be possible to receive these signals anywhere east of the Mississippi River.

Schedule of Standard Frequency Transmission from WWV

Eastern Standard Time	Signal	Kilocycles (wave length in meters) July 17	Aug. 15	Sept. 13	Sept. 28
10:55 to 11:04 p.m.	General call	425	425	425	500
11:04 to 11:08 p.m.	Standard frequency	(705)	(705)	(705)	(600)
11:08 to 11:11 p.m.	Announcements				
11:15 to 11:19 p.m.	General call	500	500	500	700
11:19 to 11:23 p.m.	Standard frequency	(600)	(600)	(600)	(428)
11:23 to 11:26 p.m.	Announcements				
11:30 to 11:34 p.m.	General call	666	666	666	900
11:34 to 11:38 p.m.	Standard frequency	(450)	(450)	(450)	(333)
11:38 to 11:41 p.m.	Announcements				
11:45 to 11:49 p.m.	General call	850	850	850	1,100
11:49 to 11:53 p.m.	Standard frequency	(352)	(352)	(352)	(273)
11:53 to 11:56 p.m.	Announcements				
12:00 to 12:04 a.m.	General call	1,000	1,000	1,000	1,300
12:04 to 12:08 a.m.	Standard frequency	(300)	(300)	(300)	(231)
12:08 to 12:11 a.m.	Announcements				
12:15 to 12:19 a.m.	General call	1,250	1,250	1,250	1,500
12:19 to 12:23 a.m.	Standard frequency	(240)	(240)	(240)	(200)
12:23 to 12:28 a.m.	Announcements				
12:30 to 12:34 a.m.	General call	1,500	1,500	1,500	1,700
12:34 to 12:38 a.m.	Standard frequency	(200)	(200)	(200)	(176)
12:38 to 12:41 a.m.	Announcements				
		Oct. 7			
1:55 to 2:04 a.m.	General call	1,350	.....	.....	.....
2:04 to 2:08 a.m.	Standard frequency	(222)	.....	.....	.....
2:08 to 2:11 a.m.	Announcements				
2:15 to 2:19 a.m.	General call	1,500	.....	.....	.....
2:19 to 2:23 a.m.	Standard frequency	(200)	.....	.....	.....
2:23 to 2:26 a.m.	Announcements				
2:30 to 2:34 a.m.	General call	1,600	.....	.....	.....
2:34 to 2:38 a.m.	Standard frequency	(187)	.....	.....	.....
2:38 to 2:41 a.m.	Announcements				
2:45 to 2:49 a.m.	General call	1,700	.....	.....	.....
2:49 to 2:53 a.m.	Standard frequency	(176)	.....	.....	.....
2:53 to 2:56 a.m.	Announcements				
3:00 to 3:04 a.m.	General call	1,800	.....	.....	.....
3:04 to 3:08 a.m.	Standard frequency	(167)	.....	.....	.....
3:08 to 3:11 a.m.	Announcements				
3:15 to 3:19 a.m.	General call	1,900	.....	.....	.....
3:19 to 3:23 a.m.	Standard frequency	(158)	.....	.....	.....
3:23 to 3:26 a.m.	Announcements				
3:30 to 3:34 a.m.	General call	2,000	.....	.....	.....
3:34 to 3:38 a.m.	Standard frequency	(150)	.....	.....	.....
3:38 to 3:41 a.m.	Announcements				

Radio Amateurs Aid Victims in Oklahoma Flood

SAND SPRINGS, Oklahoma.—Sticking to their radio sets for three days and nights during the unexpected rise of the Arkansas River, radio amateurs in this vicinity recently maintained communication between here and Tulsa when floods swept a large section of Tulsa County. Fully 500 people were driven from their homes and thousands of dollars damage was caused by the high water which put wire lines out of commission.

The towns are connected normally by an electric interurban road, four telephone lines and the telegraph line, but all were down except the latter and one telephone line. Most of the flood victims, whose homes had either been destroyed or made uninhabitable, were housed temporarily at a park here and fed until the water began to recede. Meanwhile scores who frantically besieged local telephones had to wait three hours before they could get a call although the distance is only seven miles.

Halton H. Friend, a member of the American Radio Relay League, offered to send messages through by radio, also bulletins on the rise of the river for the daily newspapers at Tulsa. He got in touch with Raymond U. McKinney, 5SG, John B. Lewis, 5WX, at Tulsa, and Earl W. Abrey, 5GA, at Osceola, Ark. The first night they kept fifteen minute schedules until 2 A. M. and the next two nights forty minute schedules until after midnight for the emergency.

Scores of personal messages were sent relieving the minds of relatives of those who had lost their homes. Amateur stations were also utilized by newspaper reporters who were unable to use wire lines on account of the limited service.

Important but Neglected

MANY single circuit sets could be improved over 50% by the use of a potentiometer in the filament-grid circuit. The control of the set is made a little more difficult, but the results gained will more than pay for the added trouble.

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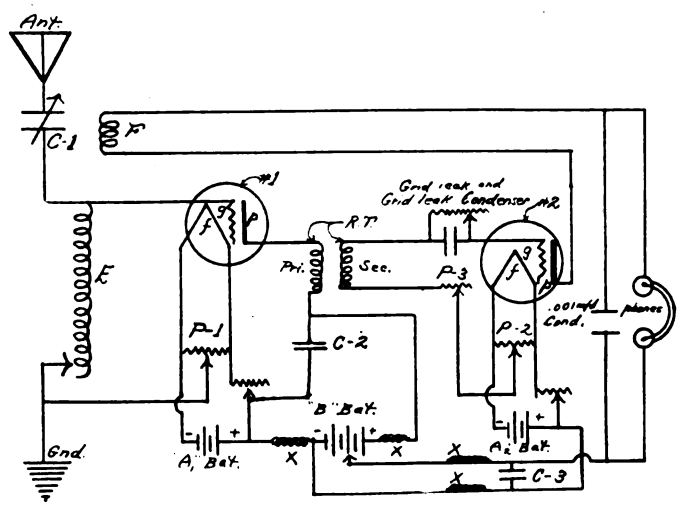
Radio-Frequency and Regeneration Combined

By C. White, Consulting Engineer

RADIO-FREQUENCY amplification and regeneration is going to be just as popular in the near future as the single circuit regenerative tuner is today. For the past year radio-frequency amplification and regeneration have only been considered as two separate and distinct methods of radio reception. The former was considered ideal since it was very quiet, but the latter proved to be more efficient and popular because more could be done with one tube using regeneration than by any other known method. It has been a battle of smooth and quiet operation versus economy and compactness. No one ever thought of combining the two on a commercial scale nor did any amateur ever think it was advisable to tackle; it either meant that he would have a radio-frequency outfit or a regenerative receiver, and not a combination of the two. But conditions have favorably changed on the radio market and parts which were not readily obtainable for amateur use are now to be had at almost any radio supply store. These parts are namely large size paper condensers, often called telephone condensers, and radio and audio-frequency choke coils. The coming of the UV199 tube has materially aided the accomplishment of the feat since it is now possible to operate a multiple tube outfit much cheaper than it was to operate one of the older types of tubes. Then again, with the past year we have changed some of our hard and fast ideas in regard to detectors and, in reality, it is this change of ideas that has made it possible to use low filament current tubes. Heretofore we have considered a soft or gaseous tube as the only one that was capable of use as a detector. Still the gaseous tube was not only more difficult to manufacture with uniform quality but required quite a high consumption of power to operate its filament at the correct temperature. It was also very erratic and critical requiring quite a bit of skill to handle it successfully. This idea has been thrown to the winds for all the new series of tubes are hard or high vacuum tubes. These tubes when used correctly in a circuit give very much clearer and louder volume than the old type of detector, but they must be used correctly.

The circuit illustrated herewith is the old reliable and simple single circuit regenerative receiver with one stage of radio-frequency amplification. The choke coils X are absolutely essential to the correct operation of the set. These choke coils which are .1 henry inductance act together with the bypass condensers C-2 and C-3, thus forming a sort of filter arrangement that effectively blocks out radio and audio-frequency currents from passing through the common "B" battery, thereby preventing serious leakage and coupling. The condensers C-2 and C-3 should be paper condensers of 1.0 micro-farad capacity apiece. The potentiometers P-1, P-2 and P-3 should have a resistance of 400 ohms apiece, and, in order to prevent noise in tuning it is better to get the carbon pile resistance units, since wire units do not make it possible to smoothly vary resistance from a minimum to a maximum. The condenser C-1 must be a well insulated 23 plate air variable with a vernier attachment or plate. The main tuning coil and tickler feed-back coil is the unit E-F which is a good 180 degree coupler, using the coil F as the rotor and the coil E as the stator tuning inductance. Failure of the circuit to regenerate properly will most likely be due to the fact that the tickler is connected in the circuit backwards, which condition is easily cured by reversing the wires connected to the terminals of the tickler coil. The other parts of the receiver are self-explanatory and can be ascertained from the standard symbols used on the schematic diagram. For portability and economy of operation I recommend the new radiotron UV199, although the circuit will operate with almost any type of hard amplifier tubes.

This receiver is especially designed for the amateur who has already in his possession a single tube regenerative receiver and wishes to add some radio-frequency amplification as well as make some changes



Schematic diagram of a circuit combining the old reliable single circuit regenerative receiver with one stage of radio-frequency amplification.

in his outfit. There are several special features on this receiver that will appeal to the advanced amateur; namely, the use of potentiometers rather freely. It might appear to be a waste of apparatus to do so, but if you will stop to consider the trouble that it prevents the outlay is readily justified. By the practise of adjusting these potentiometers you can readily learn to get maximum volume without causing the tubes to oscillate or spill over at the most sensitive spot. After tuning in you can always improve volume as well as quality by carefully turning these potentiometers. Do not use a high "B" battery potential on the detector tube (No. 2) because its action is very much better even when less than 20 volts is employed. But, on the amplifier (No. 1) as high as 80 volts can be used without impairing quality. A good make of radio-frequency amplifying transformer (R. T.) is used. The builder of this receiver is warned not to have too many turns on the rotor or tickler coil F. In fact, when this type of regeneration is used with radio-frequency you cannot critically feed-back as though no radio-frequency were employed. Connect the movable plates of the condenser C-1 to the antenna, and use a variable grid leak with a grid leak condenser of .00025 mfd. capacity.

It is, of course, rather difficult to guarantee any definite mileage for this receiver, but on try-out using only a small 20 foot indoor aerial 2,000 miles was obtained with ease and clarity that was truly remarkable.

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An Extra Super-Sensitive Receiver

By A. E. Herron

THERE has been much said and written about super-selective and super-sensitive receiving sets, but nothing has really developed as yet that would eliminate the carrier waves, noticed as whistles and squeals from one station when listening to another when the two stations are on nearly the same wave length.

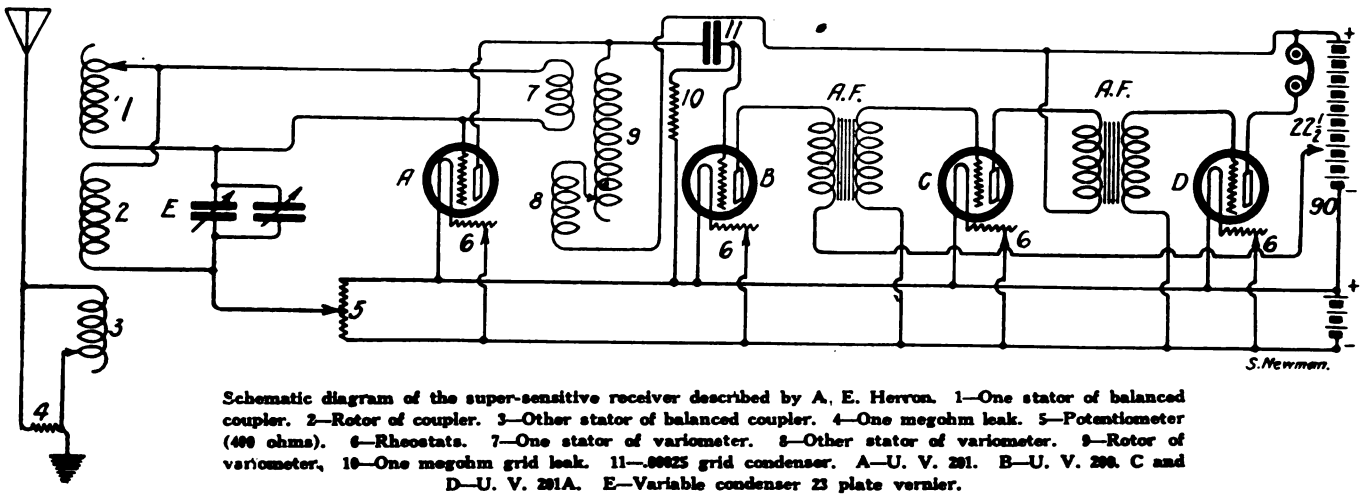
Of course, many times, especially in the cities, squeals or whistles will be heard which are due to some local receiver oscillating. These cannot be eliminated without the help of the operator of the oscillating receiver.

Whistles and squeals caused by stations being almost on the same wave lengths can be eliminated, provided there are at least four meters difference, and if both stations are not locally situated.

Every circuit imaginable was tried out (except the super-heterodyne) and none proved as selective as the one shown, which was so selective that with but one degree of variation on the coupler dial the loudest station could be completely tuned out. Even with the two plate vernier condenser a station could be tuned completely out with but two degrees on the dial. The best parts obtainable were used in making this set.

It is absolutely necessary that the windings of the variometer and coupler be connected correctly or else the set will not function properly.

The top binding post which connects with the left hand stator of the coupler is connected to the ground and the aerial connection is taken off at the switch arm. The top post of the right hand stator of the coupler is connected to the upper post of the rotor and also to the top post of the left hand variometer stator. The lower post of the left hand variometer stator is connected to the grid of the radio-frequency tube and also to one side of the variable condenser and the lower stator post of the right hand coupler. The lower post of the coupler rotor is connected to the opposite side of the variable condenser and also to the potentiometer. The lower post of the variometer rotor is connected to the plate side of the radio-frequency tube. The upper post of the rotor is connected to the lower post of the right hand variometer stator. The upper post of the right hand variometer stator is connected to the positive side of the amplifier "B" battery. The rest of the connections are simple and are made according to the diagram.



Schematic diagram of the super-sensitive receiver described by A. E. Herron. 1—One stator of balanced coupler. 2—Rotor of coupler. 3—Other stator of balanced coupler. 4—One megohm leak. 5—Potentiometer (400 ohms). 6—Rheostats. 7—One stator of variometer. 8—Other stator of variometer. 9—Rotor of variometer. 10—One megohm grid leak. 11—.00025 grid condenser. A—U. V. 201. B—U. V. 200. C and D—U. V. 201A. E—Variable condenser 23 plate vernier.

This set has been in operation aboard S. S. "Collingwood" on the Great Lakes for some time. The set is absolutely noiseless in operation—in fact if it were not for the sight of the glowing tubes one would think it was a crystal set he was listening with.

Tuning of this set is very simple once the action of it is understood. When first tuning the condenser is left at about twenty degrees, then the rest of the tuning is easily done by means of the coupler and variometer using the vernier condenser for fine adjustment. Both variometer and coupler must be varied at the same time when tuning. The coupler and condenser are used for varying the wave length and the variometer and potentiometer are used for controlling the volume. The variometer must be left at the point where a click is heard in the 'phones. If left any distance from the click it will tune broadly or the station may not be heard at all.

A vernier rheosat should be used in the detector and radio-frequency tubes although not absolutely necessary.

If a series condenser is used in the aerial circuit a one megohm leak should be connected across the aerial

(*Concluded on next page*)

The parts necessary for the construction of this set are as follows:

One Kellogg variometer, one Kellogg variocoupler, one 23 plate vernier variable condenser, two Federal audio-frequency transformers, two C. H. rheostats plain for U. V. 201 A, two C. H. rheostats vernier, one C. H. potentiometer, two double sockets, one grid leak and condenser, three Federal jacks, two switch arms and knobs, three dials, 6″x23″x½″ base board, one 8″x24″x¼″ Bakelite panel, two brackets.

U. V. 201 Radiotrons were found to be better than the new U. V. 201 A as radio-frequency amplifiers. A U. V. 200 was used for detector and two U. V. 201 A tubes were used for audio-frequency amplification; 90 volts were used on the plate on the amplifiers and from 16 to 22½ on the detector.

The writer used a Kellogg variometer and variocoupler in this set, with an extra binding post added on top of the variometer and coupler so that the wires which connect the two stator coils could be separated and the end of each could be brought to a separate binding post. By doing this both stators could be used separately as shown.

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An Improved Turnbull DX Loop Receiver

By A. D. Turnbull

AFTER having received many letters from fans and friends as to the wonderful results obtained by the use of my circuit published in RADIO WORLD for May 19, and quite a few questions relating to whether or not this circuit could be accommodated to a loop I finally decided to evolve one for them with the results shown below.

Before giving information as to the construction of the receiver, a few words as to the tubes used will not be amiss. I have done all my work with the Canadian R-215A tubes, which are dry cell tubes similar to the popular dry cell tubes that you are accustomed to using. I have found that as good results could be obtained with these small tubes as with any others—if the set is properly tuned. Contrasting the work of both the six volt tubes and the 1½ volt tubes the difference if any is so slight that I myself could not detect it unless I measured it with resistance bridges and galvanometers, and even in that case there was but very little variation. This goes to show that the important thing in the operation of a set is not the tubes used, but how the set is tuned and how the operator constructs his set.

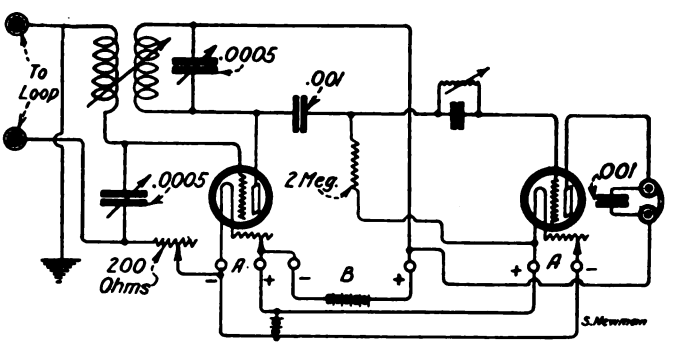
By looking at the present set and comparing it with the original diagram, but little difference can at first be noted. The technical points of the circuit remain intact except for some few changes, such as a potentiometer in the filament-loop lead, which acts as a stabilizer and permits very fine control of the regeneration and tuning. Of maximum importance is the coupler. It is much better to have a coupler that is capable of fine tuning than to get one of the bank wound type that will cause you no end of trouble through distributed capacity and dead-end losses.

The condenser capacities in the plate grid lead of the two tubes are of major importance and no other capacity will give the proper results. Of particular importance also is the two megohm grid leak in the grid circuit of the second tube, leading from the filament side of the tube to the plate-grid condenser.

When tuning in the set it will be noted that super-regenerative action ensues when the coupling of the tickler is tightened, and when this reaches a certain point, the amplification is enormous, but this must be done very cautiously, otherwise the set will howl like a cat that has been trod on. On account of this it is best to have the rotor of the coupler wound with coarser wire than is usually the case, and about 35 or 40 turns at the most.

A good ground to the grid lead side of the loop is essential to the proper operation of the set, and as queer as it may seem the reception and tuning will improve 100% when a good ground is connected. For those who do not happen to have a coupler handy, good results may be had by the use of honeycomb coils. For this purpose a coil of 50 turns for the primary and 35 turns for the secondary will do. If lower waves are desired, a 35 and a 25 turn coil can be used.

With this set operated properly and the tuning systematically done wonderful results will be accomplished, but the builder will have to become acquainted with his circuit before he obtains the best results, but as the tuning controls are quite simple it should not prove a difficult circuit for the fan to handle.



The original Turnbull receiver adapted to loop reception. Note the ground connection to one side of the loop.

As to distances that this receiver will work over, it can be said that stations 2,200 miles distant were received with perfect clarity and freedom from noise, all of course depending upon the existing conditions at the time of reception.

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and ground. This will prevent the aerial from charging if a transmitter is used as it will discharge through the leak instead of sparks jumping the condenser. This leak will not have any effect on the signal strength. When constructing the set be sure to buy the best material obtainable. Be sure that every connection is properly soldered. Tinned bus bar wire should be used for connecting the different instruments. A very great percentage of the efficiency of the set depends on the tuning. If it is thoroughly understood what each part is for no difficulty will be experienced in getting good results but even the very loudest stations will be missed if it is not tuned slowly. Take your time in tuning, and in a short while you will understand the action of the set and tuning will be very simple.

Any one undertaking to build this set will be amply repaid for his patience and trouble as, when properly constructed and operated, it will give marvelous results both in selectivity and long distance reception.

Think This Over

COULD you go out and get an automobile and learn to run it in a day by means of a book of written instructions? No—unless you were a super-man. Could you lay bricks without the knowledge of how it is done? Could you learn from printed instructions? No.

Then why do you think you can learn to tune your set by merely reading about it? Go to it and learn by experience. Your set may be turned out in hundreds from a factory, yet it has its own little twists and twirls, and individuality. You have to get the feel of it first and it may take a week or two before you can even tune in the local stations correctly.

Therefore do not get impatient and yell for assistance. Go to it and learn by doing. If you find out that your set works best when the potentiometer is at 50 and the printed instructions say that it should be at 75, leave it at 50, and consider that you have put something over on the maker of the set.

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New Regulations Benefit Amateurs

WASHINGTON, D. C.—The Department of Commerce has authorized a broader band of wave lengths for general and restricted amateur radio stations, and created a new class of amateur operator's license to be known as Amateur Extra First Class. The new regulations sent to all District Supervisors of Radio read:

Supervisors of Radio and Others Concerned:

Licenses will be issued permitting the use of any type of transmitter (CW, Spark, AC-CW, ICW, unfiltered CW and phone) with the restriction that when using pure CW they are authorized to use wave lengths from 150 to 200 meters and when using spark, AC-CW, ICW, unfiltered CW and phone the wave lengths from 176 to 200 meters only can be used. The types of transmitters must be specified in the application and the license.

Special Amateur Radio Station Licenses will be issued permitting the use of pure continuous wave transmitters only, authorizing the use of wave lengths from 150 to 220 meters.

For the purpose of application to amateur stations, pure CW is defined as follows: A system of telegraphing by continuous oscillations in which the power supply is substantially direct current as obtained from (1) a generator, (2) a battery, or (3) a rectifier with an adequate filter. (A filter is not deemed adequate if the supply modulation exceeds five percent.)

General Restricted and Special Amateur Stations are not permitted to use a transformer input exceeding one kilowatt, or equivalent of this power based upon watt input to plates if tubes are used. (When input rating of tube is not specified by manufacturer this rating will be considered as double the manufacturers output rating.)

On licenses issued for amateur stations you will include the following: "This station is not licensed to transmit between the hours of 8:00 and 10:30 P. M., local standard time, nor Sunday mornings during local church services."

Special Amateur stations must be operated by persons holding an extra first grade amateur operator's license, or a commercial first class operator's license, or a commercial extra first class operator's license. Applicants must also meet the requirements of Regulation 63.

A new class of amateur operator's license is hereby established to be known as "Amateur Extra First Grade." Licenses of this grade will be issued to persons passing the required special examination with percentage of at least seventy-five and code speed in sending and receiving at least twenty words a minute, five characters to the word; who have had at least two year's experience as a licensed radio operator; and who have not been penalized for violation of the radio laws subsequent to the date of these regulations.

Respectfully,
A. J. TYRER,
Acting Commissioner.

Approved:
S. B. DAVIS,
Acting Secretary of Commerce.

The Radio Woman

THE Editor has shown me a letter from Miss May Clough, of New York State, who encloses a check for a renewal of her subscription for RADIO WORLD and in which she says: "I appreciate the paper very much and greatly enjoy keeping up with the new developments and news of radio. I have constructed the Sorensen set, described in your issue of January 20, using a U. V. 199 tube, and it proves very satisfactory. Your last number gives me an idea and I am going to replace the variocoupler arrangement with a coil mount to facilitate changing coils."

This is a fine letter and I'm tickled to death to hear from a woman radio enthusiast. I would like every woman who has built a set to write and tell me her experiences.

* * *

Granny Tector recently made one of her long-promised trips down from the farm to see us. I guess it is nearly four years since she was here last, and she is the dearest thing ever. Even though four score and seven years old, she boasts the fact that she has never missed a single Sunday at church. Out where she lives it is a two hour ride in the "buggy" to church, but that doesn't detain that dear old lady. Seeing as how we were getting ready for a picnic in the woods that afternoon, we thought that we would take our church via radio, and accordingly made our plans. Granny prettied up and waited patiently for us to start, and when we told her that we were going to church by radio she was all a-flutter, but later on after she had sat through the entire service with a pair of phones on her ears she remarked in a quavering voice, "Well, I never! I often heard tell of 'tending meetin's' by proxy, but this is the first time I ever thought of being in church by turning on a light."

* * *

That afternoon we went out in the woods, of course, taking our set along with us, and turned on the beautiful organ music from one of the big broadcasters. She listened intently, often following the well known strains by humming in a high pitched voice, and after we had turned it off and started back home, she insisted that we must take her out and get one of those. "It'll be such a help to pa now. You know he still has rheumatics, and that two hour ride to church doesn't help him digest his Sunday dinner any—and I suspect that he sleeps in church anyhow, and this will keep him from sleeping, 'cause I can set right opposite him and keep him 'wake."

Try This on Your Set

SOME time or other in the life of the average radio fan, he hears some little weak station which is just beyond the range of audibility. He knows it is there and can very faintly distinguish music or voice but he cannot bring it in. He fiddles, fusses, fumes and curses, getting gradually hot under the collar. Eminent scientists tell us that getting mad is very injurious to the liver and should not be indulged in.

The next time that you hear one of those "whispering stations" instead of getting sore, just place a crystal detector in your grid lead between your grid condenser and the tube, then turn on your tube, find a sensitive place on the crystal and try and get him again. You will be surprised to find the station that whispered before is plainly audible now. You may not notice much change in volume in local stuff, but for distance it is just the thing.

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Transformers in Theory and Practice

By Charles Byrnes, A. I. R. E.

TO the uninformed mind, transformers are little double coils with or without an iron core, that are put in the circuit because the diagram calls for them. Some people credit them with amplifying signals, and others have gone even so far as to accuse them of changing an alternating current to a direct current. In reality they do neither, but serve to change an alternating current from a higher to a lower or from a lower to a higher voltage. In the first case the current is increased, in the second case the current is decreased, and each in direct proportion to the decrease or the increase of the voltage.

A transformer usually has two distinct windings which are not connected to each other in any way, except through magnetic lines of force. The resistance of the magnetic circuit is reduced, in low frequency work, by the presence of an iron core. Transformers for very high frequency, however, have no cores other than air. The winding at which the current to be transformed enters is called the *primary* and the other winding is called the *secondary*.

The theory of the transformer is based on the theory of coils of wire in a changing magnetic field. In a given field, the greater the number of turns of wire the higher the voltage and the lower the amperage will be across the terminals. If one coil, energized by an alternating E.M.F., is allowed to act upon another coil within the field, it will be found that the voltage and amperage of the second coil will be in direct proportion to the number of turns which it includes, in relation to the number of turns in the first coil.

As an illustration let us assume that the primary coil is wound with 100 turns, and the secondary coil with 1,000 turns, or ten times as many turns as are in the primary. We exert an alternating pressure of 10 volts on the primary with a current strength of five amperes. If the transformer was 100 per cent. efficient we could expect a current of .5 of an ampere at a pressure of 100 volts in the secondary. If the number of turns was reversed and there were 1,000 turns on the primary and 100 turns on the secondary, we could expect a voltage of one, and an amperage of 50 at the secondary.

To impress the relationship more clearly we can find an analogy in mechanics that is first rate. Let us belt together two pulleys, as shown in the accompanying drawing, the larger pulley to be just twice the diameter of the smaller. If a turning force of 10 pounds is applied to the large wheel, which revolves at the rate of 100 revolutions per minute, a turning force of five pounds may be had from the small wheel, but at a rate of revolution of 200 a minute. That is, of course, assuming that the belt transits the entire enery without loss.

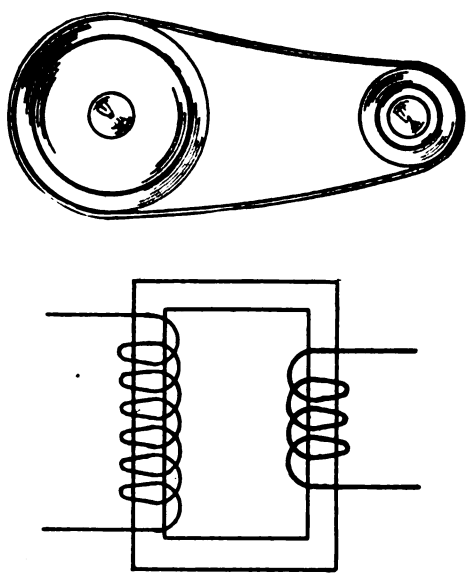
If we now link turning force with voltage, and revolutions with amperage, we have a parallel in the action of a transformer and the action of belted pulleys. The larger the wheel, in proportion, the greater the turning force and the lesser the speed. The greater the number of turns, the greater the voltage and the lesser the amperage; and vice versa.

In transforming energy of any kind 100 per cent. efficiency can never be attained; and this also applies to electrical transformers. One form of loss is called copper loss, which is occasioned by the resistance of the wire. Another is core loss, or *hysteresis*, which results from the inability of the molecules of iron exactly to follow the rapid alternations of the current to which a transformer is subjected. Ninety per cent. efficiency is considered very good in actual practice.

Transformers are usually used in receiving work in connection with vacuum tube amplifiers. They do not act as amplifiers themselves, but merely step up the voltage of the plate circuit of the preceding tube, or in some cases act simply to create two separate circuits, dividing the detector from the amplifier. Where the step-up principle is used, the increased voltage applied to the grid of the amplifier tube controls a relatively larger current in the amplifier plate circuit.

Practically the same action takes place in the radio-frequency air core transformers. Loose couplers and variocouplers are forms of air core transformers. Also, high frequency coils of the Tesla and Oudin types work on the same principle.

Larger iron core step-up transformers are used in spark transmitting stations to produce the high voltage necessary to jump the gap and charge the condensers.



Analogy between two pulley wheels of different diameters and the two coils of a transformer.

Still larger ones are used on alternating current transmission lines. By this means the voltage can be boosted and the amperage reduced with the result that a very large power can be sent out over comparatively small wires. There are step-down transformers at certain distributing centers, where the voltage may be cut and the amperage boosted for local consumption.

Step-down transformers are sometimes used in radio receiving work, to cut down the house current before going into the rectifier which supplies the current for vacuum tube filaments. Step-up transformers are used in the same manner to supply the plate current for transmitting tubes.

Beware of Oil Cloth!

Do not use oil cloth as a covering for your radio cabinet or as a cover for the table on which the set stands. Oilcloth holds atmospheric charges and will cause numerous clicks in your set. Silk has the same properties and should not be used to clean rubber panels or cabinets. The best material for this purpose is a soft woolen rag duster or feather duster.

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Radio and the Traveler of 1930

By Solon Crane

IT is the year 1930. Our home is in New York. We are about to take a trip around the world.

There is not the usual excitement and flurry preceding the date of sailing as steamship passage, stateroom accommodations and the many other attendant details have all been arranged beforehand by radio. Our passport has been secured on unusually short notice, due to verification and endorsement from Washington via the ether waves.

Wireless power transmission has been achieved. Our ship carrying us across the ocean is electrically propelled—receiving its power from a mammoth transmitter located on the mainland. We are guided safely past rocks and shoals by the warning signals sent out from radio-controlled sirens and lighthouses.

The second day at sea we receive a message stating that reservations have been made for our accommodation in a Paris hotel. The equipment of the vessel permits us to carry on telephonic conversation, en route, with friends in London, Paris, or New York. This is most convenient, as little matters of unfinished business may be consummated very satisfactorily; in many cases saving a disagreeable loss, both in time and money. The great expanse of water surrounding us does not disconnect us from the life of our home country, for news is constantly coming in over the invisible waves.

The evenings on the boat offer all the livelihood of the city and there is entertainment for all classes. To the aesthetic group comes the opera, "Pagliacci," as it is being broadcast from the Metropolitan Opera House. The young folks get the dance music from an orchestra conducted by a Vincent Lopez or a Paul Whiteman located somewhere in the Big City. The old fellows who refuse to leave their business at home stand around a horn from which pours an endless string of stock quotations and market reports. Others listen to lectures on their favorite subjects.

After passing the half-way mark on the ocean, things begin to pour in from the continent. The Europeans are wide awake regarding the possibilities of the radiophone as an instrument for the dissemination of propaganda. Politics fly everywhere. Oh, what a conglomeration of jargon—English, French, German, Spanish, Russian, Greek, Italian—all trying to impress their views on the newcomers. The French conduct one commendable policy—that of offering a short speaking course in their language, for the benefit of tourists. It sounds queer to go into a room and hear a large group of people repeating, over and over, and each in his own way, "comment allez vous" "tres bien, mercie," and "Oui, monsieur," according to the instructions coming from the mouth of a tin horn.

Landing at Cherbourg, we take the first train to Paris. The trains now are not the slow, stuffy affairs of the past, but attain a truly creditable speed due to their electric motors supplied by radio power, and the air is kept in circulation by electric fans supplied from the same source.

During our stay at the French capital we have occasion to use our pocket receiving sets; and while walking the streets we can pick up time signals, announcements of the various features of current interest in the city and other reports, all being broadcast from the Eiffel Tower.

In most of the towns on the continent we notice a marked progress. This is chiefly due to the success of wireless power transmission. Electricity is found in the small hotels, and even in some of the peasants' quarters, with its accompanying light, heated rooms and warm water.

We leave Europe for a little sight-seeing trip to Egypt. Even at Gizeh, in the shadow of the pyramids, a spot representative of silence and mystery, we are still sitting on the door-step of the world. While an aged muezzin in a towering minaret in Cairo calls the followers of his faith to prayer, we listen to the strains of a violin in the hands of a master of the period, being hurled to the extremities of space.

After a delightful trip down the Nile, we arrive at Khartoum; only to find to our dismay that we had miscalculated the expenses of the journey and are without money. A radiogram from Cairo extends our credit.

We learn that a trip down through the center of Africa, from Alexandria to Cape Town, is now perfectly safe. Radio "land-marks" have been set up at determined distances, and by the aid of a small receiving set, it is almost impossible for an explorer to get lost. However, we reserve that trip for another time, and start on our way for Suez.

The trip across the Syrian desert is no longer shrouded with terror, for the bandits are rather shy of the wirelessly equipped military airplanes that may be summoned on very short notice. So, light of heart, we take this route over to Bagdad.

Despite some modernizations, the city of the Arabian Nights has lost but little of its charm. However, the great arm of radio is in evidence. By its aid, modern entertainment is obtainable at numerous places. At one time, when listening in on our pocket receiver, we are astounded to hear a disciple of the Prophet calling the familiar "There is no God but Allah."

Proceeding on our journey we reach Bombay and go inland through the Indian jungle. One day we become separated from our guides and are apparently lost. Our pocket receivers again prove of value, for upon listening we hear the party sending instructions that will guide us to safety.

At Darjeeling we learn from returning travelers that Everest has been conquered—with the assistance of radio. Exploring and mountain climbing parties had kept in touch with each other by means of these all-pervading ether waves, and had worn electrically heated suits receiving their energy from radio power.

In China, by the messages flying through space, we learn that the nations of the world are disputing their rights to each other's claims in this country. In one province we are held, pending the radio visa of one of the consuls. The government weather reports are very useful, as the conditions at the present time are uncertain.

For several days after leaving the Hawaiian Islands the air continues to vibrate with the strumming of the ukeleles and guitars of those balmy isles.

Our ship is guided into the port of San Francisco by waves emanating from a submerged cable. Someone is taken very sick, before the boat docks, and the attention of a specialist is at once secured via radio.

After once more putting our foot on native soil we proceed by radio-controlled conductorless train to our home city, our friends learning of our arrival by radio, before the train has completed its journey.

Once more in New York, we sit down and ponder. We have travelled around the world, but our home and friends were always with us. We are now at home, but, thanks to radio, the world is at our door.

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Safety in the Use of Terminal Blocks

By Arthur S. Gordon

WHENEVER a panel is in danger of being overcrowded, the thing to do is to shift the battery terminals around to the rear of the receiver. This is done by employing a small strip of hard rubber or other insulating material drilled so as to take the number of binding posts necessary, which is usually four in the case of a single tube receiver and five in the case of multitube outfits. This strip is known as a "battery terminal block" and is generally screwed on the rear edge of the baseboard, either in an upright or horizontal position. It is usually upright when the instruments are not to be enclosed in a cabinet, and horizontal when they are to be so enclosed. Fig. 1 shows the two applications of the terminal block idea, A and B, the latter sketch also indicating the manner in which a cabinet may be built over the block.

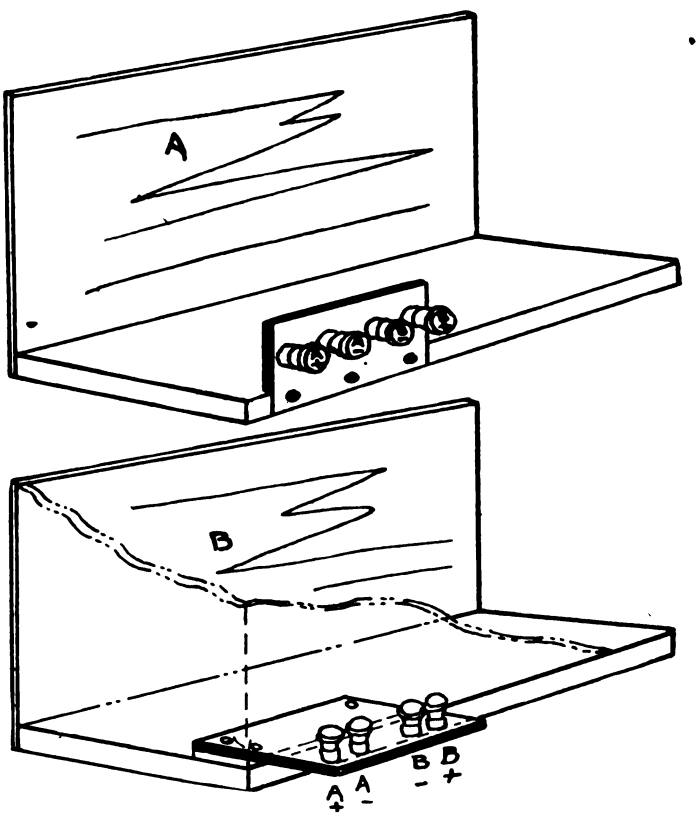

Fig. 1—Two methods of using a terminal battery block on your panel. It simplifies connections and keeps unsightly wires and connectors from the front of the panel.

The advantages of having the battery connections go to a terminal block in this manner are many. Not only is the panel simplified, but the task of wiring the set is made much easier. The leads are shorter, for one thing, and for another the grand mixup of wires rushing to eight terminals on the face of the panel is somewhat cleared out. This shortening and separating of leads makes for greater efficiency. Moreover, the appearance of the receiver is enhanced because the battery leads approach the set from the rear, instead of from the front. Because of these points the use of the terminal block is especially recommended for amplifier units, where there is a limited panel space and where there is need for a device of this sort to lessen the chance of a wrong connection.

While on this subject of A and B battery connections, some radio enthusiasts may have noticed with surprise that some of their more advanced radio friends use three binding posts instead of four. Most hookups call for four binding posts, and the majority of sets use them, but as a matter of fact, only three are necessary. (See the single circuit regenerative hookup, Fig. 2) *The extra binding post, while not needed at all, is added to minimize the chance of burning out your tube by wrongly connecting the B battery terminals to the A battery binding posts.* In the case of only three binding posts, this can be done very easily by merely touching the A+terminal with the B+lead, provided, of course, that the rheostat is turned on. Amateurs who disregard the safety check afforded by the fourth binding post do so at a risk that most of us do not care to take.

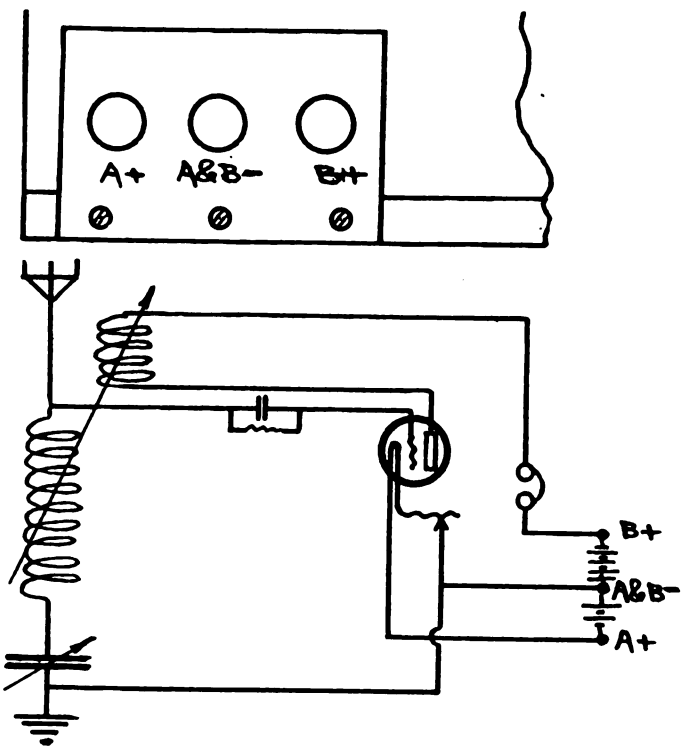

Fig. 2—Suggested method of using the terminal block. Note that one binding post serves for both the A and B minus.

Watch Out!

MANY constructors intend using the new U. V. 199 tubes but do not take into consideration that a six ohm rheostat will not efficiently operate these tubes. The resistance should be 30 ohms —not 6, and care should be taken that not over three dry cells in series are used.

A Little Now and Then

DO not forget to occasionally oil the moving parts of your set. Shafts of the rheostats, couplers, variometers and condensers need oil, and a drop of light machine oil sometimes adds to the ease of working these parts and keeps them in good working order.

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RADIO PRIMER

For the New Army of Radio Beginners

By Lynn Brooks

SOLDERED CONNECTIONS: In radio circuits all connectors should have as low resistance as possible. Therefore large sized wire is used in connecting and all connections are soldered. You not only assure yourself of low resistance joints where this is done, but you prevent any of the connections working loose or corroding.

Few people know how to solder correctly, and while it is an art in itself it is simple if it is once understood. In order to correctly work with a soldering iron, certain apparatus is necessary. The first is a well tinned soldering copper. For radio work this should be a light iron, as it is often necessary to get in small corners, and the regulation tinner's iron is incapable of doing this. Therefore if you cannot obtain an electric soldering iron, of the kind specially made for radio work provide yourself with a four ounce copper one.

The next important accessory to a successful soldered job is a good non-corrosive flux. Do not make the mistake of using an acid base flux, for if you do, it will corrode the copper wire and cause you no end of trouble. About the best flux for radio work is a resin base flux, with powdered resin as a close second choice. As the iron will have to be tinned before it will flow solder properly into a joint, it is next necessary to tin the iron. Place some of the flux, or resin on a tin plate. Heat the copper until it begins to show green flames around the edge. Do not make the mistake of burning the iron by letting it get red hot. When it is sufficiently hot take a piece of solder (wire solder is best as it is easier to work with) and rubbing the iron gently in the flux, melt the solder and rub the iron around in it until the solder coats the surface. When all four sides of the tip of the iron have a nice coating of solder you are ready to solder any joint.

Before soldering a connection, see that all the surfaces are clean and free from any grease or dirt. It is best to scrape the surface of each piece with emery paper to make sure. Then apply a light coat of the flux. Do not use much, but just enough to allow the solder to flow freely. If too much is used it will spread and cause a dirty looking connection and dust and dirt will stick to it. Have the soldering iron hot (*not red hot*) and apply the tip of it to the joint, to allow the parts to get warm. Then still holding the iron to the joint, apply the solder. When a small amount of solder has melted and run to the joint, remove the solder and leave the iron there a few seconds until the solder runs into every crevice and a nice smooth joint is made. If the iron is not hot enough this will not happen, and a dirty lumpy joint will be the result, but never let the iron get so hot that it burns the tinned surface off.

The iron should frequently be scraped with the emery paper and retinned. A connection should never be attempted unless the surface of the iron is bright and shiny with a good coating of solder.

SOLDERING OUTSIDE WIRES: Where work has to be done in the open, such as soldering the outside wires of an antenna, it is best to use a gas torch and a special paste. Because of the fact that copper dissipates heat quickly, a soldering iron will not hold the heat long enough to properly solder it. Therefore make up a paste of your regular soldering paste and pour plenty of finely filed solder into it. Mix enough of this to make a thick lumpy material, and when ready, place it all around the connection and apply the heat of the torch until it melts and flows into the joint.

Amateur Gets First News from Arctic Ship

HARTFORD, Conn.—Old IZE, the amateur radio station operated by I. Vermilya of New Bedford, Mass., who is claimed to be the first transmitting amateur in the United States, was the first to receive an authentic press report from the MacMillan Arctic expedition after the schooner "Bowdoin's" departure from the Maine coast.

The previous day a personal message was sent by Donald H. Mix, radio operator on the schooner, to Mr. Vermilya, who is manager of the New England Division of the American Radio Relay League. This radiograph, telling how the New Bedford station's signals were received, read:

"We are now in Boothbay and expect to leave for Sidney. Your signals very strong, will reach Pole easy. The MacMillan Arctic ship spent the day preparing for sea, adjusting compass, lashing deck cargo, etc. Captain MacMillan expects to put out to open sea."

The first message from WNP received by any amateur station was picked up by 1CKP, at South Manchester, Conn., owned by George H. Pinney of that place and operated by Charles A. Service, assistant secretary of the A. R. R. L. Mr. Pinney was thanked for a gift of silverware.

These are two of the most powerful amateur stations in New England and both owners expect to maintain constant communication with WNP. Mr. Vermilya is so anxious to have his transmitter reach the "Bowdoin" that he has sought permission of the management of the New Bedford hotel to erect a "super-antenna" on the roof of the building.

He maintains an experimental license, IXAL, which enables him to operate with extra high power. His station will be equipped eventually with four 250 high tubes, giving it a total power of 1,000 watts. With this outfit he believes it is an easy jump from New Bedford to the North Pole.

New Broadcasting Stations

(Licensed Week Ending June 29, 1923.)

Call	Station	Frequency Kcys.	Wave Length, Meters	Power, Watts
	New Class A Stations			
WSAK	Daily News, The, Middleport, Ohio.	1,160	258	20
WTAB	Fall River Daily Herald, Fall River, Mass.	1,210	248	10
KFHS	Nelson, Robert Washington, Hutchinson, Kan.	1,310	229	50
WHAR	Paramount Radio & Elect. Co., Atlantic City, N. J.	1,300	231	15
	Transferred from Class C to Class A			
KRE	Berkeley Daily Gazette, Berkeley, Cal.	1,080	278	50
WKAR	Michigan Agricultural College, East Lansing, Mich.	1,070	280	100
XFAR	Studio Lighting Service Co., Hollywood, Cal.	1,070	280	200

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Major General James G. Harbord, president of the Radio Corporation of America, sailed for France last week on the "Paris."

* * *

The maximum daily light requirement of an average American home is 460 candles, or eighteen times that of a century ago, and the cost is only two-thirds of what it was then.—*Floyd W. Parsons.*

* * *

Increases in wages of deck and engineer officers, radio operators and members of the stewards' department on Shipping Board vessels ranging from $7 to $20 a month are announced by Vice-Chairman T. V. O'Connor of the board. The increases are effective immediately.

* * *

Every up-to-date ship in the bootlegging fleet in "rum row," off the New Jersey and Long Island shores, is said to be equipped with a wireless set, which is used for both entertainment and business purposes.

* * *

The recent radio fair held in Mexico City aroused considerable interest, and there has been an increase in sales of radio telephone apparatus. Some low-priced German equipment is now coming on the market, the Department of Commerce has been advised.

* * *

David Sarnoff, vice-president and general manager of the Radio Corporation of America, is famous as the man who, eleven years ago, received in New York, from the S.S. "Olympic," 1,400 miles at sea, the message confirming the sinking of the S.S. "Titanic."

* * *

The Shipping Board receiving station at London reports that, for the past two years, they have had much heavier static in winter than in summer, and that, although heavy static has been experienced during the past winter, receiving conditions have now greatly improved.

* * *

Radio and the phonograph are not really competitors, but complement each other in the public's purchasing mind, according to a phonograph sales manager. He claims that neither is a substitute for the other as far as public or household entertainment is concerned. In the case of a prominent after-dinner speaker the phonograph will not enable the public to hear him, but radio will. If a musical composition by a favorite performer is desired at a specific time the phonograph record is ready to reproduce it. The sales manager says his company is erecting a new record-making building, which he hopes will enable him to catch up with his demands.

Radio communication between Singapore and Christmas Island was established recently, a report to the State Department advises.

* * *

During a single day, May 25, 1923, the Navy Department Communication Office handled a total of 858 messages. This was the "high mark" in two years' service.

* * *

The United States has in nightly service nearly twice as many electric lights as the people of the next seven most important countries combined, according to the New York State Committee on Public Utility Information.

* * *

Henry A. Stone, of Roselle Park, N. J., since 1909 chief electrician of the New York Stock Exchange, died last week in the Bonnie Burn Sanitarium at Scotch Plains, N. J., aged 57. He was one of Edison's early electrical lieutenants.

* * *

Arthur T. Nelson, commissioner of the Missouri Board of Agriculture, informs RADIO WORLD that Station WOS, owned by the state of Missouri and operated by the State Marketing Bureau, Jefferson City, Mo., has changed its wave length from 360 to 441 meters, or 680 kilocycles. The station's slogan is "Watch Our State."

* * *

Leonard E. Curtis died at his home at Colorado Springs, Colo., last week at the age of 75. He was born at Norwalk, Ohio; was graduated at Yale College and practiced law in New York City till 1896, when he removed to Colorado. He was distinguished as an electrician. He was author of a volume of world-wide travel and reminiscences of Edison, the Maxims, Westinghouses, Tesla, and other electrical notables.

* * *

James H. McGraw, president of the McGraw-Hill Company, publishers of New York City, has presented to Princeton University a valuable library of 3,000 volumes on the French Revolution. The books were assembled by the late William D. Weaver, of Charlottesville, Va., a naval and electrical engineer who was for many years editor of the *Electrical World.* In making the donation Mr. McGraw said that he was prompted by his high regard for Mr. Weaver and "to show my appreciation of what Princeton University has done for the higher education of young men of our time, including three of my own sons."

General Gouraud Addresses America Over Radio

(C. Photonews)
General Gouraud, the one-armed hero of France, who recently spoke to the radio audience through Station WJY, from the 69th Regiment Armory, New York City, where he reviewed the veterans of the Rainbow Division. As the General does not speak English, it was necessary for his aide-de-camp to translate the speech. The General was amazed at the enormous strides we have taken in radio, and was duly impressed when told that hundreds of thousands of unseen but intent listeners were hearing his praise of the American troops that were under his command during the war.

Radio Public Hears President Harding's St. Louis Speech

(C. Underwood and Underwood)
Last week the entire country was enabled to be a part of the vast audience that heard President Harding speak from the St. Louis Post Dispatch Radio Station KSD. Whereas you formerly had to wait for the papers and despatches in order to keep in touch with the activities of the President, you now can be right at his elbow by means of your radio set. Never before has the President been able to keep in such personal contact with the people of this nation as since the advent of radio. The illustration shows President Harding standing beside the two microphones that picked up his every word that it might be heard in the four corners of the United States.

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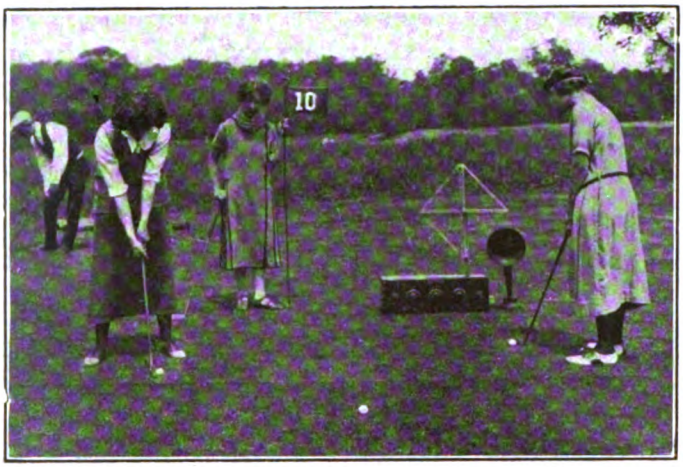
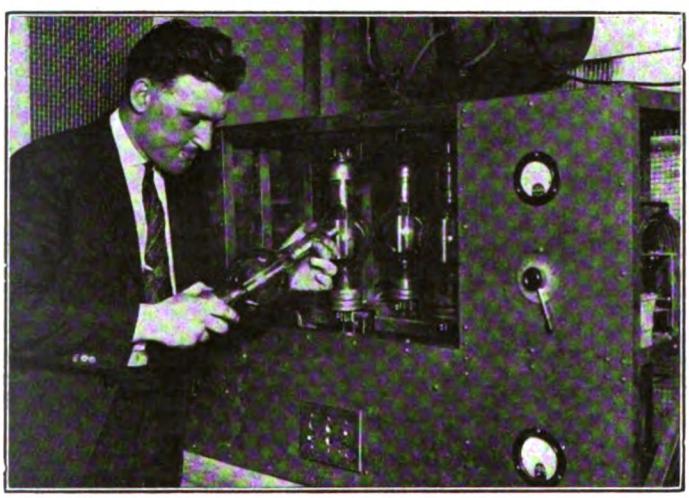


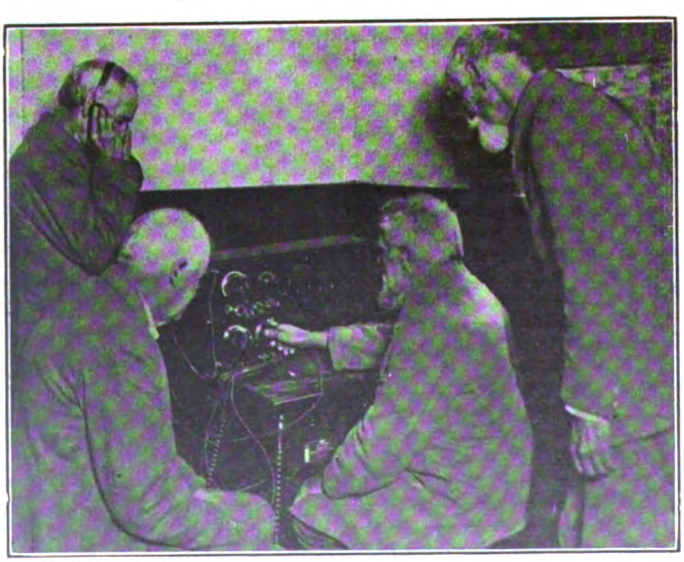
(C. Kadel and Herbert)

There are two ways of taking golf lessons, it would seem. One is by quite expensive instruction and the other method is by radio. The illustration shows three fair exponents of the game learning the gentle art of putting by means of a local broadcasting station and professional golfer, who is giving instructions via the ether waves. Wonder if instructions are necessary as to what to say when you muff one?



(C. Kadel and Herbert)

Many broadcast listeners will remember old Station WDT, the broadcast station of the Ship Owners' Radio Service. The illustration shows the new transmitter that is being used since the station has reopened and is operating on its new wave length. With the new equipment, this station radiates over ten amperes and is expected to establish some new distance records.



(C. Acme Service)

It was a great day for these grizzled Confederate Veterans when they were able to hear the decoration day servics that were broadcast over Station WSB, the Atlanta "Journal's" broadcasting station. These old war horses were given a brand new radio set and shown how to operate it, and the first program that they tuned in was the reunion services from that famous Southern station.

Two Kinds of Ra
Other News I

Captions by Robert L. D

Winners of Non-Stop Ra

(C. Kadel and Herbert)

Two entrants in the non-stop six-day radio golf contest tuning in KF during the last few members of a local radio club on Washington Heights, Ne

RADIO fans who boast of their ability to get the distant stations will have to go some to beat the record of the team that won the six-day non-stop golf contest held by members of a girls' club in New York City. Working in relays for six days and nights these girls picked up every powerful broadcasting station in the United States, and heard and recorded every radio district The total mileage was 132,000 miles, or 68,000 miles better than their nearest competitors.

Three sets were used in this work; a three-circuit regenerative, a radio-frequency set, and a neutrodyne receiver. The club announced the contest several weeks before the event, and by constant listening and careful tuning heard

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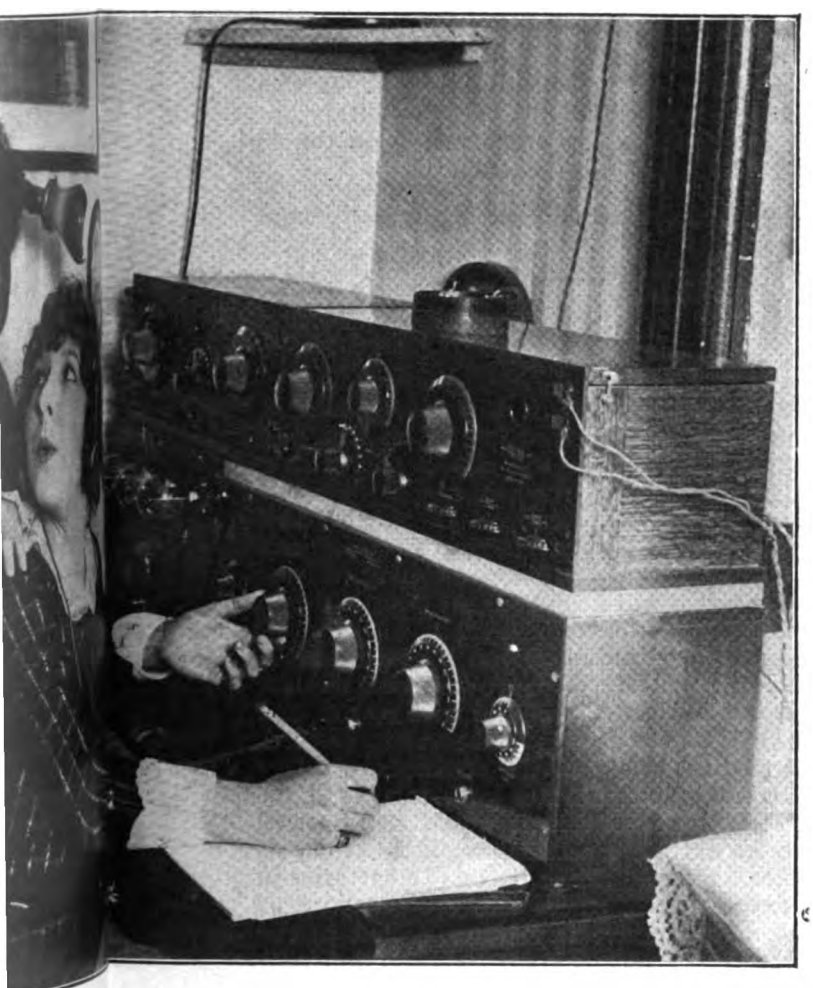
nds o Radio Golf and her News Pictures

Captions by *ert L. Dougherty*

f Non-p Radio Golf Contest



r radio golf contest be[tween] members of a local [club] during the last few hours of the contest. The contestants are both Washington Heights, New York City.

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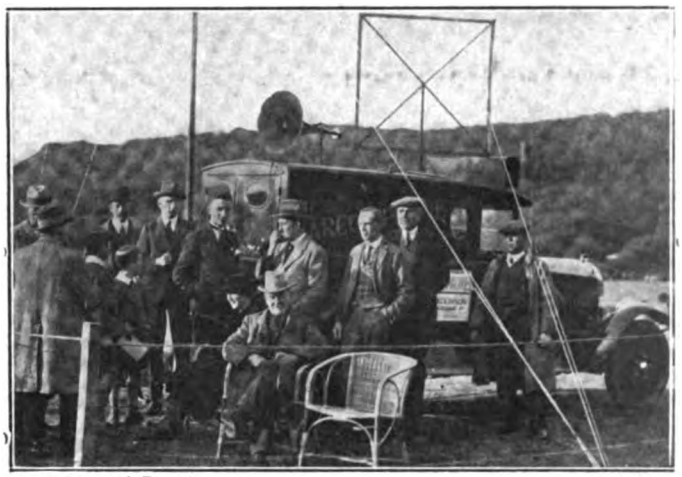
stations that it was considered impossible for fans on the east coast to hear.

As every contest nowadays seems to run along the lines of endurance, it is not impossible for this record to be beat if you possess the "stick-to-it-iveness" necessary, but you must not record a station more than once, and even at that you will have to go some to beat the record of these feminine enthusiasts.

Now, Radio Golf Hounds, come on in and see if you can't give these girls a run for their money. Let some of you that have been asking about super-regenerative and six-tube radio-frequency amplifiers see if you can't make them step. It sounds pretty hard, but if they could do it, you can, too; so go to it and "let 'er rip."

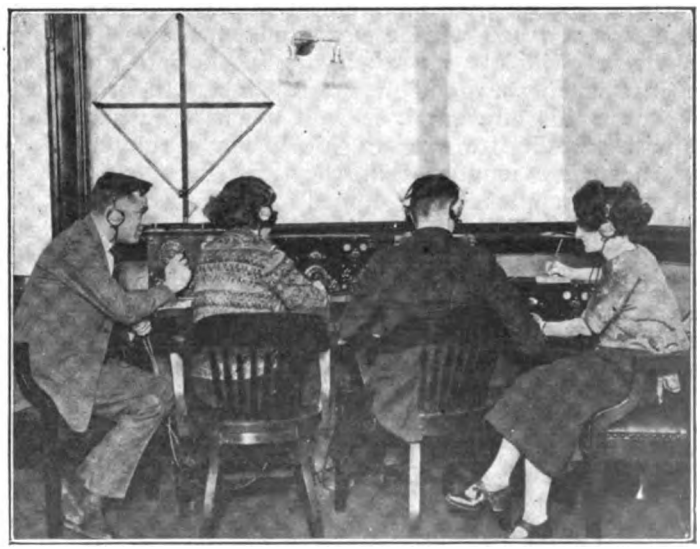


(C. Topical Press)

In order to popularize radio in England, the Marconi Company of Great Britain has equipped several motor cars with broadcasting equipment and is touring the countryside showing the people how easy it is to receive broadcast programs. The photograph shows one of the cars located at Peasholm Park, Scarboro, England, with an interested audience listening to the program on a loop receiver.

(C. Kadel and Herbert)

Mme. Marguerite Namara, American opera star, and her six-year-old daughter, who are touring France in a motor bungalow, listening to a radio program while traveling in their luxurious motor car. A loop antenna is used with a set using radio-frequency amplification and wonderful results are possible with this type of apparatus. Radio equipment is only one of the modern luxuries of this wonderful traveling home, which is as fully equipped as any modern bungalow.



(C. Kadel and Herbert)

The Federal Telephone and Telegraph Company staged a novel radio golf contest between employees of their several offices. Using the various types of sets that the company makes the employees set about to get the most stations. The contest was limited to one hour, and the winner was J. B. Ritchey, 90 Alexander Square, Newark, N. J., who won by copying 28 stations with a total mileage of 3,800 miles. Mr. Ritchey, the winner, is the man with the dark suit.

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Paris Has Boulevard Radio Concerts

By Carl H. Butman

THE well-known Parisian daily, *Le Matin*, is operating a concert radio receiving set in front of its office on a popular boulevard, where crowds gather to listen to news, concerts and statistics from fourteen amplifying horns. The amplifiers are sufficiently loud to be heard over the terrific traffic noises, Consul Ives reports from Paris.

The public listening-in station was installed by the Societé Francais Radio Electrique which broadcasts two concerts daily on 1,780 meters. Other broadcasting is done by the Eiffel Tower on 2,600 meters, and the Superior School of the Telegraph and Telephone Service of the Government on 450 meters.

No provision for a royalty to broadcasters has been made in France, beyond the payment of an annual fee of ten francs to the French Postal Service by owners of wireless receiving sets. The Eiffel Tower radiations are sent out for the general public, and the Superior School broadcasts are carried on in the interest of education and experimentation. The Societé Francais Radio Electrique, however, states that it obtains its remuneration by the sale of the Radiola receiving sets adapted to the broadcasting system used by the Societé, explaining that in order to receive its wireless concerts properly it is essential that a Radiola set be used. The assertions of the company are borne out by private set owners who say that other receiving sets are unsuitable for the company's broadcasts, concerts being heard very indistinctly with other sets if at all.

Listening-in is becoming popular in France, it is reported, although not as extensively as in the United States. Anyone may own a receiving set there, but transmitting outfits must be licensed by the Government. French receiving sets are advertised for sale as low as 250 francs each. No specific import duties are prescribed for complete radio receiving sets, but the different parts are dutiable separately.

Most of the French broadcasts are on long wave lengths, except those of the Superior School. It was learned recently, however, that the French military authorities are experimenting in broadcasting on the 45 meter wave.

Summer Tips to Summer Fans—No. II

By R. L. Dougherty

Another little point that will cause no end of trouble to the inexperienced fan who is radiovacationing is the dew. This is not meant as a pun or joke. A heavy fall of dew in the evening can practically ruin the receiving range of a receiver. The dampness will soak through the set and form numerous little short circuits. It will collect on the panel, between the switch points, on the coils of the rheostat, around the grid leak, and in fact every place that it is possible. Make sure when you take the set away with you that you have ample facilities to keep it dry. A good heavy cover the inside edge of which is lined with felt or rubber will suffice—if the cover is clamped on when the set is not in use. The dew will also spread over the insulators and coat them with a goodly layer of moisture which will short the insulator and you will be surprised when you find that your set will lose its sensitivity in the late evenings, just when the good programs start. In order to overcome this bugbear it is well to coat the insulators with paraffine, or even to shield them if they are strung in such a manner that they can be shielded. Good heavy wrapping paper dipped in oil or paraffine, formed into a tent-like shape and hung over the insulator will keep the insulator dry and serviceable, even through a heavy rain. When shielding it do not make the mistake of using something for a shield that will short the antenna itself. Tin or metal should not be used. Don't run your antenna through leafy trees or foliage.

As a hint to fans who take away crystal sets it will be well to caution them to carry plenty of spare crystals that have been tested for sensitivity, as well as an extra set of catwhiskers. While on the matter of crystal sets it would be well to tell the crystal fan to lightly oil all moving parts, such as sliders, with a good watch oil or sewing machine oil. Don't bathe the parts with it, but just use enough to keep them lightly lubricated and keep them from corroding or rusting.

One of the important details in a set is cleanliness, and this should not be neglected in the set that you take on your vacation. Dust will collect easier on a portable set in the country than on one that is left on the table and constantly cleaned. Do not let dust collect between switch points, binding posts or any other place. A light brushing every morning or evening with a fine brush will keep your set clean and you will not be hunting for trouble.

Finally, as an added caution if you intend taking a tube set with you it will be well to provide some method of keeping the tube safe. A box lined with cotton, and the tube carefully placed in this is the safest method, unless you desire to "chaw up the atmosphere" after a hike or ride when you find that your tube is "gone galley west." In line with this, it would also be well to incorporate an extra dry cell and small B battery as reserve supplies. Strange things happen to batteries in different climates, and in places like the seashore or mountains when it is extremely warm or hot in the day and cool in the evening you are liable to find your batteries die on you very quickly, or else they will get lumpy and "start shootin'" out of the cover. If you have an extra on hand which you have kept dry you will not have to miss an evening's fun just because you have to send to the city or the nearest town for a new one.

Newsdealers, Attention!

Many newsdealers have found that there is a constant demand for back numbers of RADIO WORLD. If you have a copy or two of current issues over from week to week, keep them in stock and you will find that your customers will want them.

Back numbers of RADIO WORLD contain a wealth of information for everybody interested in radio.

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Latest Radio Patents

Ringing Over Multiplex Transmission Channels

No. 1,454,150: Patented May 8, 1923. Patentee: L. Espenschied, Queens, N. Y.

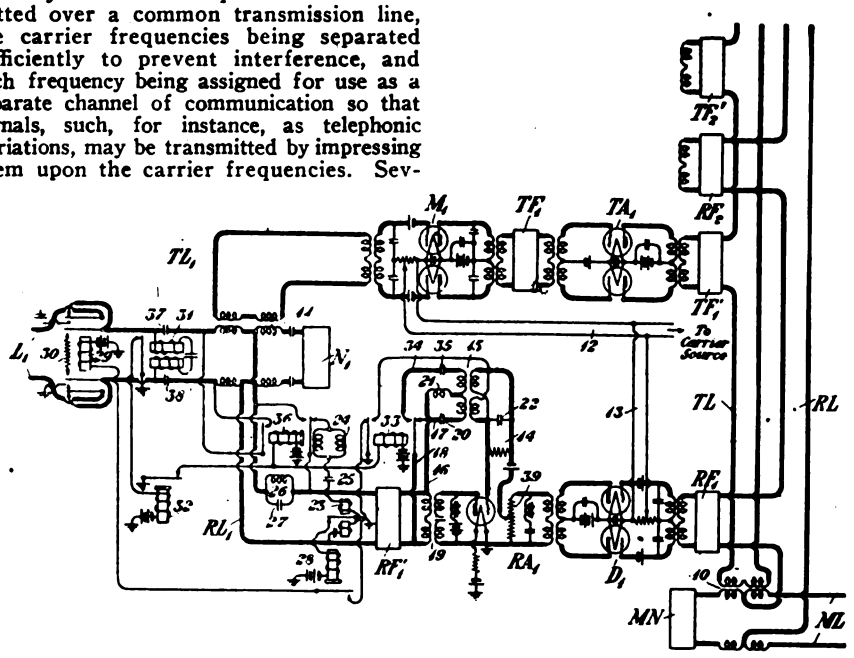
This invention relates to transmission systems and more particularly to multiplex transmission systems employing carrier currents. The present application is a continuation as to common subject matter of applicant's prior application, Serial No. 314,074, filed July 29, 1919.

Where multiplex transmission is attained by the use of carrier currents a plurality of carrier frequencies are transmitted over a common transmission line, the carrier frequencies being separated sufficiently to prevent interference, and each frequency being assigned for use as a separate channel of communication so that signals, such, for instance, as telephonic variations, may be transmitted by impressing them upon the carrier frequencies. Several channels may thus be superposed upon a common transmission line and each channel performs the functions of an ordinary telephone transmission line.

In ordinary telephone transmission it is customary to transmit over the line, in addition to the telephone currents, ringing currents or other signaling currents, for the purpose of signaling between operators in establishing connections. In order to obtain practical telephone service over each carrier communication channel, it is desirable that the channel be utilized for the transmission of such ringing or other signaling currents as well as for the transmission of ordinary telephone currents.

This invention, therefore, concerns means whereby ringing and other signals may be transmitted for each carrier channel.

The invention likewise has reference to the provision of a transmission system having included therein a vacuum tube which normally acts to produce one desired result, but which under other conditions, operates as a generator of oscillations.



Espenschied's method of duplex telephone transmission.

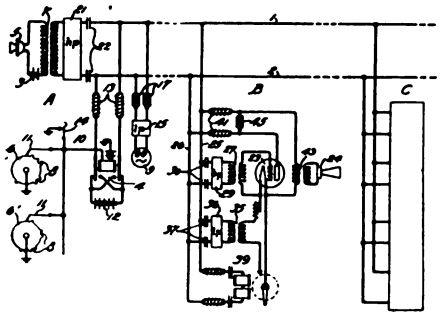
Energization and Control of Vacuum Tubes

No. 1,456,528: Patented May 29, 1923. Patentee: Herbert E. Shreeve, Wyoming, N. J.

THIS invention relates to the control and energization of vacuum tube amplifiers, and aims to economically effect such control and energization from a distance.

Any or all of the quantities (*a*) input electro-motive force for the tubes, (*b*) plate current, and (*c*) filament current, may be supplied from a point remote from the tubes over a wire system being simultaneously used for intelligence communication purposes; and the amplifiers may, if desired, be selectively rendered operative and inoperative by means of impulse selectors or the like controlled over the same wire system.

The invention is especially useful in selective signaling systems, such, for instance, as train despatching systems employing loudspeakers at various stations along the right of way, and is disclosed hereinafter with particular reference to such systems. However, the invention obviously may be employed in connection with other systems where distant control or energization of vacuum tubes is desirable without departing from the spirit of the invention or the scope of the appended claims.



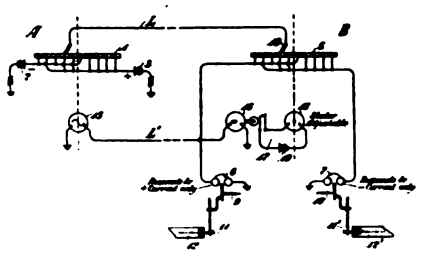
Method whereby filament and plate current can be transmitted from a distant source.

With a large number of stations distributed over a long railway line, to supply batteries at the stations for energizing the amplifiers would be unduly expensive, especially since there are ordinarily no battery charging plants at the stations. According to this invention the undue expense is obviated by supplying energy to a number of such tubes from a distance, and using the signaling wires along the right of way to transmit this energy. Further, in accordance with the invention, the operation of the tubes is controlled from a distance by selectively controlling the filament current of the tubes, for instance, and the signaling wires along the right of way are employed for effecting this control.

System for Measuring Distortion

No. 1,455,843: Patented May 22, 1923. Patentee: Maclean Kirkwood, East Orange, N. J.

THIS invention relates to telegraph systems and more particularly to the measurement of the distortion in telegraph signals due to the transmission over the line. Heretofore it has been customary to judge the quality of telegraph signals by ear, an expert operator being able to distinguish between good and "clippy" or "heavy" signals; but the results of such tests are uncertain and unsatisfactory. It has also been proposed to make a record of the undistorted signal as sent out and a record of the distorted signal as received and to compute the distortion by comparing the lengths of corresponding spacing or marking impulses. It is the object of the present invention to provide means for indicating directly the distortion itself.

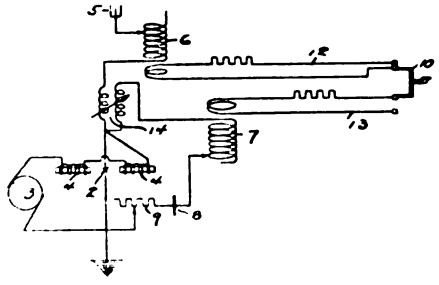


System by which it is possible to visibly measure distortion in telephone and radio signals.

Radiotelegraphy

No. 1,454,630: Patented May 8, 1923. Patentee: H. F. Elliott, Palo Alto, Cal.

The invention relates to radio telegraphy signalling systems and particularly to single wave signalling systems, in which the source of oscillations is connected to the antenna circuit and to a local oscillating circuit, the electrical constants of the two circuits being such that the oscillations may be caused to prefer one circuit to the practical neglect of the other. Systems of this nature are particularly advantageous in continuous undamped wave signalling, in which the source of oscillations is an arc or other continuous undamped wave generator.



New system for the control of local oscillations.

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Answers to Readers of Radio World

Can Erla radio-frequency transformers be used in a two-tube reflex circuit in conjunction with Jefferson audio-frequency transformers? My set uses these transformers, and I get nothing but loud beat notes and squeals. Can the use of definite transformers cause this?—Jules F. Lavalette, Box 287, Lenox, Mass.

These transformers (both audio and radio) can successfully be used in reflex circuits. Be sure that you have the right connections, and that your transformers do not interfere with one another. A method of preventing this interstage coupling is to separate them a sufficient distance and, if possible, shield them by means of foil or screening. In the audio-frequency transformers it is sometimes helpful to ground the cores of each transformer to the ground post, but extreme care should be taken first in finding out whether the cores of the transformers are not used to make one of the connections. Go over your connections very carefuliy and make sure of all of them. In reflex circuit construction it is best to solder each connection.

* * *

Will the circuit shown in the January 20 issue by Arthur Gordon work a loud-speaker? Can a Flewelling circuit be made with two steps of audio-frequency amplification, and where can I obtain the circuit diagram for the additional two steps? I have been thinking of trying the G. W. May circuit, in the February 17 issue. Can that circuit be accommodated to a loud-speaker? —G. W. Archer, Tabernash, Colo.

If you add two steps, or one step and a power amplifier, to these circuits they will all operate a loud-speaker. A suitable two-stage audio-frequency diagram for all of them appeared in RADIO WORLD for March 31 in answer to a question similar to yours. If the circuit is to be used with anything but a Flewelling it will be necessary to remove the grid leak that is hooked across the primary of the first transformer. If you desire to construct a power amplifier we refer you to RADIO WORLD for June 9, where you will find a suitable description and diagram by C. White, consulting engineer. This power amplifier, in conjunction with one stage of straight amplification, will allow tremendous amplification, and will suit your needs.

* * *

In the use of a loop antenna, is it possible to tune out two stations when they are both on the same wave length? Will a loop antenna work on a crystal detector and one stage of audio-frequency amplification?—C. J. Dickenson, West New York, N. J.

When two stations are on exactly the same wave length it is not possible to tune either one out and get the other without interference. It is generally the case that, if the set is detuned a bit, or the loop turned at right angles and the set manipulated correctly, the stronger station will be heard the clearest; but the elimination of the other station entirely is impossible. It is not advisable to use a loop antenna on a crystal set as the results are so poor that it is just wasted energy in putting it up.

* * *

Kindly inform me where the transformer T2 shown in RADIO WORLD for Feb. 27, in connection with the power amplifier of C. White, may be purchased.—E. K. Seibel, 317 Broadway, Hannibal, Mo.

Address a letter to the writer of the article, care of RADIO WORLD and re-state your question.

I have constructed a three circuit Armstrong regenerative set with two steps of audio-frequency amplification. I am continually bothered with a squeal. The apparatus is laid out as shown in the accompanying sketch. I do not have to throw the antenna switch to get the squeal started, as all that is necessary is to turn on the tubes. The detector and one step works quite well, but I cannot get any results out of the second stage.—Donald Edwards, Box 12, Callicoon, New York.

From your description and the sketch it is very easily seen that your transformers are entirely too close. There should be quite a bit of space between the first and second stage transformers and they should be placed at right angles. You state that you placed them close to save space. This is wrong. Suggest that you separate them at least six inches and place them at right angles. The trouble you are experiencing is due to magnetic coupling between the transformers. The trouble you notice when you place your plate variometer at zero is due to the fact that the set is oscillating. This will cause a howl because the set is tuned wrong. Re-wire your amplifying circuits and run your leads so that those of the first and second stages do not interfere, or run parallel for any distance. If possible it is good practice to ground the core of the second stage. When doing this, be careful that the metallic part of the core is not used as a connector for some part of the winding.

* * *

Kindly explain how I can use the outside light wires as antenna. I notice that the Flewelling published in RADIO WORLD *is different from one that I saw in another publication. Yours uses three condensers and the other one called the "Flivver" used but one. Which is the best?—Geo. Read, 1224Plainfield Ave., Grand Rapids, Mich.*

It is never advisable to use outdoor light wires as antenna. Where lighting wires are strung on poles, it is always best to leave them alone. They may be high tension and serious injury if not death will ensue if they are tampered with. Run your antenna away from them and take care that your antenna does not cross them. The circuit you mention is an adaptation of the original Flewelling as published in RADIO WORLD. It has been found that the circuit will function without the bank of three condensers, although not as much volume will be produced.

* * *

Would the U. V. 201A tubes work as efficiently as the U. V. 199 in the Grimes inverse duplex circuit? Where can I get a blue print of this set in order to enable me to build it?—F. H. Gripp, Penokee, Kan.

These tubes will work in the circuit you mention. We do not carry blue prints of circuits or panel layouts. You do not need blue prints to build this set. Follow the diagram and plan your own panel layout. Care should be taken, however, to see that it is done correctly or the good results possible with this circuit will not be obtained. Follow the diagram exactly.

* * *

I would like to know if I need a permit to operate the combined receiver and transmitter as shown in the accompanying sketch.—Jos. Rossi, 302 West 55th St., New York City.

A license is required for any transmitting station and you will have to obtain a license before you can operate such a set.

Will a WD-11 tube operate on a loop antenna in a house? Will it operate on a light socket antenna? Would there be any advantage gained in the use of both of them together? Kindly inform me of a good audio-frequency transformer to cost around $5.00. What size and how much wire should wind on a good home-made loop?—A Constant Reader, 242 Mountain St., Montreal, Canada.

With a properly designed circuit it is possible to get a WD-11 tube to work on either a light socket antenna or a loop. A single tube reflex circuit with crystal detector is best adapted for this purpose. There would not be any decided advantage gained in the use of both together. See our advertising columns. There are several advertised. We cannot give the name of any make of competitive apparatus through this column. For the construction of a homemade loop about 10 turns of either stranded light cable, or No. 18 wire on a three-foot square frame will do for broadcast work.

* * *

Can I construct the power amplifier described by C. White in RADIO WORLD *for June 9, by the use of regular audio-frequency transformers hooked up as per sketch? If possible should I use the ratio as shown in the sketch? (Two low ratio and two high ratio). Can a Ford ignition coil be used for the purpose?—Edward H. Bitner, 1510 Catherine St., Harrisburg, Pa.*

It is impossible for you to use transformers for such a purpose as you suggest. The transformer which has to be used is a special transformer made especially for that purpose, and the use of any other type will not be satisfactory. If you attempt to use two transformers hooked in series as shown you will generate a double frequency which will cause terrible howling, as the two transformers will virtually buck each other.

* * *

I have the three circuit regenerative set as shown by the enclosed diagram. I cannot get any distance out of it, and it does not give me very good volume. The furthest station that I have received as yet is KDKA, and I have a hard time getting that. What can I do to improve my set? —Leslie Baverstock, 654 Humboldt St., Brooklyn, New York.

The three circuit regenerative set is somewhat tricky to manipulate and it is best to get thoroughly acquainted with it before trying for distance. You might put a 23 plate condenser in your secondary circuit which will help your selectivity somewhat. Outside of that there is nothing that can be done but getting used to the control and tuning of it. Make sure of your connections, and see that they do not run too far parallel, and that they cross at right angles.

* * *

I recently purchased a set incorporating what was said to be a "German Mercury" tube. After about a week of use the tube did not work, although it lights very bright. Can anything be done to restore the sensitivity of the tube?—Carl Spangerberger, Woodstock Manor, Kansas City, Mo.

We have no knowledge of the tube you mention. If it is a make of tube imported, we advise you to get in touch with the party who sold it to you and make your report. There is no reason for a tube to stop rectifying as long as the tube lights up, unless you have injured the plate or grid by rough usage.

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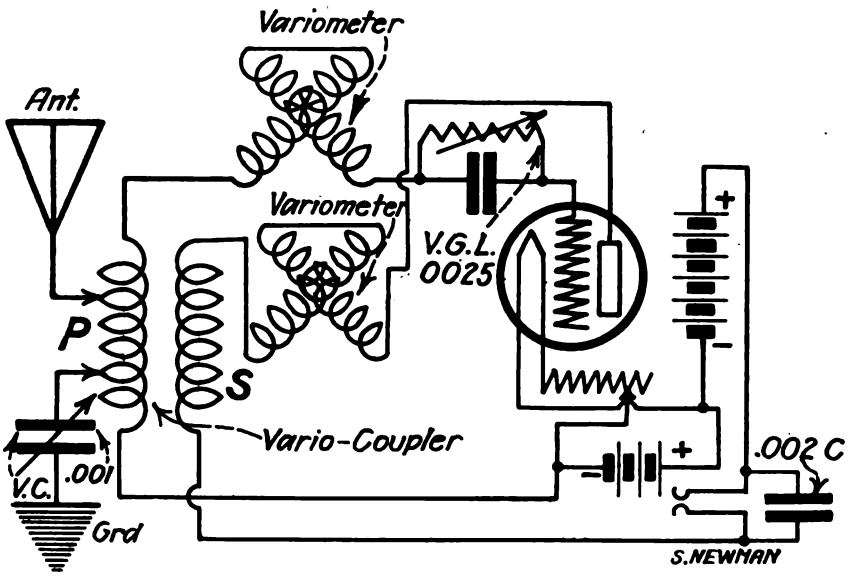
An Extremely Selective Single Circuit One Tube Set

By A. Clapholtz

SINCE the allocation of new wave lengths in broadcasting, the interference between different stations has been almost entirely eliminated. At the same time there are a lot of single circuit receivers that are still bothered with interference. Owning one myself, and being able to hear the powerful broadcaster WEAF over the whole range of my coupler on account of the fact that I live but a half mile from that station, and desiring to tune him out, I tried to develop a single circuit regenerative tuner that would enable me to get DX and at the same time hold the volume of the original circuit.

With this point in mind I thought of combining the three circuit and the single circuit, using the selectivity of the triple circuit and the volume of the single circuit. I finally hit on the circuit described, and if a fan wants real selectivity and volume on one tube, the added expense of rebuilding his single circuit will be amply repaid the first time he turns on his tube and tunes in. For selectivity it can't be beat.



Extremely selective circuit as described by A. Clapholtz.

The only changes that will have to be made in any single circuit receiver that uses the rotor of a coupler as a tickler, will be to add two variometers, one in the grid circuit and one in the plate circuit.

The only change that will be noticed is the manner in which the set will be tuned. In tuning in a station with this new variometer single circuit, both variometers are placed at 100, and the rotor of the coupler turned to about 35 or 40. At this point, a squeal will be heard in the phones, and the grid leak is here used to diminish the squeal. When it is done, leave it alone, because the grid is then set, and does not need to be touched any more. Then setting the primary circuit into approximate resonance with the station desired (you can use the same setting that you do when using the regulation single circuit), rotate the plate variometer until the carrier wave of the station is heard. You will hear two squeals. It is directly between these two that the station is. When you have your receiver quiet, except for a frying spatter resembling fat in a pan, turn the plate variometer until it snaps out with a click. Then go back with the plate variometer and tune in until it is just below this point, and the music will be heard nice and loud, without any interference from any station. I can listen to WGY and not be bothered by any interference once the set is properly tuned, and because of the fact that the rotor of the coupler does not have to be bothered with much, the tuning is practically all done with the plate and grid variometers.

A word about capacity effects on this set would not be amiss. When shielding this set, I have found that better results have been obtained by grounding the shielding to the minus side of the A battery. The set should be shielded with either copper foil or gauze, because it is much easier to obtain good contact on copper than tin foil as tin foil corrodes quicker and good contact is harder to make.

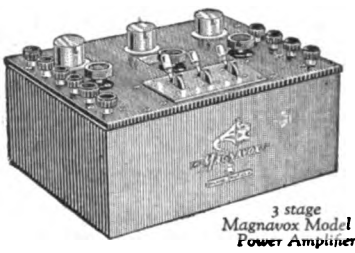
Spread of Religion by Radio

SCHENECTADY clergymen whose services have been broadcast now look upon the radio station as a powerful gospel missionary. Words spoken in a church in the presence of a small group of people are given wings and travel to thousands of homes reaching the aged and the infirm and many who, but for the radio, would not hear a church service. Village churches, locked because of a shortage of ministers or inability to provide for a pastor regularly, now open their doors and the congregation worship with the Schenectady church membership via radio.

After every service letters reach the pastor from all parts of the country. One clergyman was recently told of two elderly women, too feeble to go to church, who dress each Sunday in their best finery and sit at their radio set, hats and gloves on, and devoutly listen to the service. During the scripture reading they follow the pastor in their Bibles and at the offertory they solemnly place a modest offering in a plate at their side. At the end of the service the money is sent to the pastor who has been speaking to them.

A lumberjack recently wrote one of the Schenectady ministers that he had heard a church service for the first time in eleven years, and that it had taken him back to his "Sunday School days."

MAGNAVOX
Radio Products



The Power Amplifier for your Magnavox Reproducer

The Magnavox Power Amplifier Model C, as illustrated, is a true *Power* Amplifier, and free from elements of distortion.

Switching from stage to stage is made easy by master switches. Any standard amplifying tube can be used.

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . **$90.00**

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field **$60.00**

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . **$35.00**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

Magnavox Radio products can be had of good dealers everywhere. Write for copy of our new booklet.

The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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THE RADIO BUSINESS IS GETTING INTO FINE SHAPE. AS FORBES SAYS: "THE BEST STEEL IS THAT WHICH HAS UNDERGONE THE HARDEST POUNDING."

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

W. H. Harmon, State Highway Dept., University of Tennessee, Knoxville, Tenn.
William J. Abele, 72 Alden Ave., Pittsfield, Mass.
C. M. Pinkerton, Radio Doctor, Box 103, Guthrie, Oklahoma. (Repairs and sells sets, supplies parts.)
C. G. Boyles, Box 288, Bellwood, Pa. (Retailer.)
H. B. Mockler, Colerain, Mass.
A. Browne, 3 W. 104th St., N. Y. C.
B. Hennessy, 30 5th Ave., New Rochelle, N. Y.
Richard B. Wilbur, P. O. Box 564, Peabody, Kansas.
A. J. Ingalls, North Granville, N. Y. (Radio supplies.)
L. E. Martineau, 334 Topping St., St. Paul, Minn.
John F. McManus, Haswell Park, Middleton, Mass. (Assembles sets for sale.)
Leon Pelcher, Jr., 230 Jackson Ave., Mineola, N. Y. (Wants names of firms that sell radio sets on weekly payments.)
Shirley I. Burke, 205 Bowers St., Jersey City, N. J.
Geo. M. Williams, Alverda, Pa.
Ernest C. Mohler, Whitewood, S. D.
Michael C. Quinn, 103 Rockland St., New Bedford, Mass.
W. N. McKee, Jr., Matthews, N. C.
Carl Fehr, 2506 N. Anthony St., Ft. Wayne, Ind.
J. B. Jamison, Radioman S. S. "M. A. Reeb," care Marine Post Office, Detroit, Mich.
H. Page Bailey, 646 West 9th St., Riverside, Cal.
I. H. Byrne, 330 Clementina St., San Francisco, Cal. (In market for reliable receiver.)
R. E. Schwartz, 206 Lake St., Buchanan, Michigan. (Dealer.)
Roselle Mfg. Co., radio apparatus, 215 Ninth Ave., Roselle, N. J.
Geo. Ennis, 183½ South Fitzhugh St. Rochester, N. Y.
M. & M. Electric Mfg. Co., radio apparatus, 5515 Spruce St., Philadelphia, Pa. (Make only high class sets.)
Joseph L. Sweeney, 26 Burgess St., Providence, R. I. (Wants a 10 ohm rheostat.)
E. C. Pumphrey, 2410 Olive St., Texarkana, Ark.
Walter Deming, High School, Belding, Mich.
Carl A. Schull, R. R., care of Tom Hicks, Mapleton, Minn.
Dunlap Tire Co., 95 Fourth St., Pratt City, Ala. (Dealer.)

Ford Building Big Broadcasting Station

A PRESS dispatch from Detroit says that at Dearborn, Mich., the largest radio broadcasting station in the world is being erected.

Henry Ford, still declining to parley with Ford-for-President clubs beyond formal acknowledgment of their letters, and put into a bad humor by newspaper stories of the boom, has made up his mind, it is understood, to talk straight to the American people in the future.

A well-defined report has it that Mr. Ford is going to put up a new kind of Presidential campaign. He is not going to tour the country and make speeches or give interviews in the newspapers. He is going to use the air instead of special trains and printing presses, so it is said.

His radio broadcasting station will put him in direct touch with every part of the country, and he will tell the voters himself, the report continues, when the great moment arrives. From then on he is expected to wage his battle for the Presidency by wireless.

Westinghouse Wins Over De Forest—Latter Guilty of Contempt of Court

IN a decree recently handed down by the United States District Court of the Southern District of New York the De Forest Radio Telephone and Telegraph Company was found to have been guilty of contempt of court in further infringement of the Armstrong regenerative patent. This decree is as follows:

1. That the De Forest Radio Telephone and Telegraph Company, the defendant herein, has been guilty of contempt of court in that it, after due notice of the injunction herein of May 27, 1921, prohibiting infringement of the Armstrong Patent No. 1,113,149, has committed, without license or authority from the plaintiffs, or either of them, the following acts of direct and contributory infringement of the said patent; namely:

(a) Defendant has sold radio-receiving sets, adapted and intended by it to infringe said patent, such sets containing variometers made and sold to the defendant by the Chicago Radio Laboratory, a licensee under the said Armstrong patent.

(b) Defendant has sold radio-receiving sets, adapted and intended by it to infringe said patent, such sets having been purchased by it from the Cutting & Washington Radio Corporation, a licensee under the same Armstrong patent.

(c) Defendant has sold radio-receiving sets, described as Type B in the order to show cause of April 19, 1922.

(d) Defendant has sold radio-receiving sets, described as Type J in the order to show cause of April 19, 1922.

2. That the De Forest Radio Telephone and Telegraph Company shall pay to the plaintiffs the sum of $9,250 to reimburse plaintiffs for expenses connected with the presentation of said violations, and shall also pay to the plaintiffs the sum of $750, which has been paid by the plaintiffs to the master as one-half of his fee.

According to the Westinghouse Electric & Manufacturing Company the above mentioned types—B and J sets—were non-regenerative as sold, but were made by the De Forest company in such a manner that they were adapted to be changed into regenerative sets, and, it is alleged, were sold by it with the intent that they be so changed.

Mogul Electric Company Enjoined Under Armstrong Patent

ON June 13, 1923, the Westinghouse Electric & Manufacturing Company, owner of the Armstrong regenerative or feed-back Patent No. 1,113,149, brought suit in the United States District Court for the Southern District of New York with application for preliminary injunction against the Mogul Electric Company, of New York City, the infringements complained of being the sales of certain radio-receiving sets made by the W. B. L. Radio Company, of Newark, N. J., which had been non-regenerative when obtained by the Mogul Electric Company, but were changed over by it to regenerative sets in violation of the Armstrong patent.

After the filing of the suit the Mogul Electric Company submitted to a decree enjoining it from further infringement of the patent.

Radio Trade Notes

R. F. YATES, former radio editor of the New York *Evening Mail*, has been appointed sales and advertising manager of the Electrad Corporation, 428 Broadway, New York City.

* * *

John C. Mitchell, 121 West 77th Street, Portland, Ore., has opened a manufacturing and distributing concern. He would like to represent eastern manufacturers on the Pacific Coast.

* * *

Sicon Radio Mfg. Company, 19 South Wells Street, Chicago, Ill., is said to be ready to buy anything required in the making of crystal sets.

* * *

General Supply Company, 144 North 13th Street, Lincoln, Neb., is reported as being in the market for tubes and loop antenna.

A. E. Hancock Co., 908 Congress Avenue, Austin, Tex., now a radio retailer, will open a jobbing business next month.

Injunction Secured Against Radioceive Company

THE International Electrical Supply Company, 29 Broadway, New York, has secured from Vice-Chancellor Badres an injunction against the Radioceive Manufacturing Company, 368 Jelliff avenue, Newark, N. J., prohibiting the latter from selling radio headsets in New England, New York and New Jersey. The New York company alleges that the Radioceive Manufacturing Company contracted, on April 27, to permit it to handle exclusively this territory.

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Next Program of WGY Is a Good One

WGY, the favorite radio station in the great vacation grounds of the Thousand Islands, the Maine coast and woods, the Adirondacks and the Catskills, has a good program to offer for the week of July 15.

Sunday morning and evening, July 15, the services of the First English Lutheran Church of Schenectady will be broadcast. The sermons will be delivered by the Rev. Herbert D. Shimer.

The Troy Music Study Club will offer the program for Monday night. Ruth Don, a concert pianist; Everett T. Grout, tenor, and Alice Clough-Wilsey, violinist, will give the Tuesday program, July 17.

The Salvation Army Band of Schenectady, N. Y., a favorite organization with WGY listeners, will give a concert Thursday night, July 19. Samuel Slater is the director. The band will be assisted by Mme. Chantemerle, reader, who will give readings from "Les Miserables" in French.

Two concerts will be broadcast by WGY Friday evening, the first at 7.45 and the second at 10.30, Eastern Standard Time. The early program will consist of piano, soprano and baritone solos. At the later concert the Solka Orchestra will give a program of Polish music. Miss Ethel Thomas, soprano, and James Early, pianist, will assist.

Mail Service Radio Changes

THE Air Mail Service, Post Office Department, has ceased to utilize the radio circuit between Reno and the naval radio station at San Francisco, a leased wire service having been inaugurated by the Post Office Department between those points. In discontinuing use of the radio circuit the Air Mail Service expressed its thanks to the Navy Department for the efficient service rendered them for the past three years. Air Mail Service traffic previously handled by the naval radio station at Chicago has been taken over by the Post Office Department station at Maywood, Ill.

Wired Wireless in Germany

EXPERIMENTAL work in wired wireless is progressing in Germany, Consul Richardson advises the Department of Commerce. Recently communication was effected between Berlin and Stolp on the Baltic coast over a 400-kilometer line. This high-frequency telephone line has been turned over to the federal post authorities by the firm of Lorenz A.-G. Three calls at a time were put through successfully—one on the normal wave length, another on a 45-kilometer wave and a third on a wave of 25 kilometers. Instead of cathode tubes a special high-frequency generator was used.

Spielman Company Moves

THE Spielman Electric Company, Inc., New York City, are moving into larger and more convenient quarters at 311 West 59th street. The move was necessary because of the greatly increased demand for the firm's line of Seco radio products. A new set is the latest addition to their line of specialties. M. H. Spielman is president of the concern, and John J. Monahan is sales manager.

What Radio Enthusiast Is Going to England?

RADIO WORLD would like to get in touch with a radio enthusiast, professional or amateur, who intends to visit England this summer. Please address Editor, RADIO WORLD, 1493 Broadway, New York City.

Give It to the Sick Veterans, Doctor!

DR. DONALD M. GILDERSLEEVE, a radio enthusiast, of 169 Prospect Park West, Brooklyn, N. Y., informs RADIO WORLD that he has a six-tube receiving set which he is willing to donate to a worthy cause.

RADIO WORLD suggests that the doctor present the set to the Veterans' Mountain Camp, Paradise Point, Big Tupper Lake, N. Y. This is a hospital home for veterans of the World War who have incurred disability since their honorable discharge from the army, and, due to government red tape, are barred from treatment in government hospitals. The Veterans' Mountain Camp movement was started by several posts of the American Legion, and is sponsored by them. It is now a going outfit, and is doing great good to men who otherwise would have to suffer in silence. Radio supplies, clothing, books, magazines, sweaters, etc., will be received with gratitude by the doctors in charge for the use of their patients.

For the information of Dr. Gildersleeve and other readers of RADIO WORLD donations should be addressed as follows: Veterans' Mountain Camp, Horseshoe Station, N. Y.

"Leviathan's" Shore Telephone Service

THE S.S. "Leviathan" includes in her remarkable electrical equipment a three-position private branch exchange switchboard capable of serving 600 telephones placed in the cabins and at convenient points about the vessel. When the big ship is moored to her New York dock those on board may communicate with all points covered by the Bell System, which is nation wide.

The telephones will be placed in service as soon as the vessel is moored to her pier, and they will not be disconnected until the order comes to cast off. The New York Telephone Company explains that, while telephone connections have been made heretofore between shipboard and shore, nothing quite so elaborate as the apparatus on the "Leviathan" has ever before been attempted.

Help for Charley Barrett

A LETTER signed Charley Barrett and bearing the address of 36 Broadway, Saranac Lake, N. Y., was published in Radio World for June 30. Mr. Barrett, who is living at Saranac Lake because of tubercular trouble, requested that some one donate to him a radio set outfit in order to make life more interesting.

Theodore Seebach, of 53 St. James Street, Elmhurst, Long Island, N. Y., telephoned Radio World just as it was going to press saying that he had a radio set that he will contribute if some one will supply three tubes for it.

Now let us see if we can't get Charley Barrett in a happy mood right away.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEER, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

Manufacturers, Here's An Itinerant Salesman!

EDITOR, RADIO WORLD: I am contemplating traveling by auto from here, going west and return. Having had all kinds of experience with radio outfits and instruments I believe I am well qualified to sell the same to retailers. Here is my plan: I make no city over 50,000 inhabitants down to 1,000. With my auto I stop on the street of a city at night, light my lamps and demonstrate the set I sell and the parts, too. I also give a lecture on radio. When I am through I take the names of prospective buyers and turn the same over to some retailer who handles the parts I sell. I then go to the next town and repeat the above. I expect to start the first week in August. I have the backing of the Bureau of Standards here, as well as recommendations from the best business men in this city.

What I want you to do is to get my name before reputable radio manufacturers.

I am a great booster for RADIO WORLD, which I have taken for over a year. I still have every issue, and would not take a fortune for same unless they could be replaced.

Faithfully yours,
FREDERICK BUTTS.

604 Q St., N. W.,
Washington, D. C.

Mr. Hovey, of Oklahoma, Says Business Is Good

MR. O. H. HOVEY, manager of the Southern Radio Supply Company, Perry, Okla., got out a circular last week. It was printed in two colors on letter-size sheets. It carried Mr. Hovey's dignified portrait and this bald assertion:

"It would make a cat laugh to hear some of the radio manufacturers and dealers joining in the song 'Business is going to be good this fall after the static and hot weather is over.' Oh, hell! Business is good right now if you have any 'pep' and know how to use it. Right now I am selling and installing more radio outfits each week than any other one man in the state of Oklahoma. The reason? Because I advertise right."

And to prove the last assertion Mr. Hovey is sending out copies of the Perry *Republican* carrying two ads from his firm—one of them six inches, three columns wide.

New Radio and Electric Firms

Quinplex Radio Corp., New York City, $500,000; M. L. Lewis, A. Wellman, M. Christeleit. (Attorney, C. Milliken, 36 West 44th St.)

Consolidated Radio Call Book Co., New York City, has changed its name to Conrad Co.

The Shiloh Light & Power Company, Statesville, N. C., has been incorporated with a capital stock of $10,000 by H. M. Morrison, G. W. Nash and S. G. Caugill.

The Bancroft Light, Heat & Power Company, Ltd., Bancroft, Ontario, Canada, has been incorporated with a capital stock of $1,000,000. Donald L. Cameron is director.

Don't Try It!

Mr. D. F. Hamm, Cor-sur l'Andouillette, Kan., inquires:

Q. 1. I have read in your columns of using a transformer instead of batteries. There is a transformer on the electric light pole back of our house. If I connected my set to this would it carry farther?

A. 1. Fine dust from the eruption of Mount Krakatoa fell 3,000 miles at sea.—*De Forest Stand-By.*

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Pruden Reliable Radio Specialties For Good Results

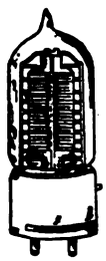
• Dealers write today for our interesting proposition.

FREDERICK H. PRUDEN, Inc.
983 Bergen Ave., Jersey City, N. J.

Extra Sensitive Tested Radio Crystal
PREPAID 30 CENTS
Each One Tested and Guaranteed
RADIO PARTS COMPANY
Lock Box 56 DUNELLEN, NEW JERSEY

Sell Shirts

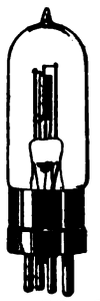
Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition. *WRITE FOR FREE SAMPLES.*
MADISON SHIRT CO., 503 B'way, N.Y. City



Send us your Burnt-out Tubes
We Repair

U. V. 200.....	$2.75
U. V. 201.....	2.75
C. 300.....	2.75
C. 301.....	2.75
W. D. 11.....	3.50

Fine Workmanship Quick Service
Mail Orders Promptly Attended to
Badger Radio Tube Repair Works
4913 North Ave. Milwaukee, Wis.



WE REPAIR WD-11, $3.50
AND POSTAGE
Also other vacuum tubes, excepting VT-1 and VT-2.
Mail orders solicited and promptly attended to.
H. & H. RADIO CO.
514 Clinton Avenue Newark, N. J.

PATENTS

To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

Send sketch or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information, and form for properly disclosing your idea, free on request. Write today.

RICHARD B. OWEN
Patent Lawyer
32 Owen Building, Washington, D. C.
2276-P Woolworth Bldg., New York City

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION
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M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.

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Technical Editor: Robert L. Dougherty

Field Representatives:
New York—Arnold D. Friedman, W. H. Oke.
Chicago—Stevens & Baumann, Inc., First National Bank Building.
Los Angeles—Stevens & Baumann, Inc., Higgins Building.
San Francisco—Stevens & Baumann, Inc., Holbrook Building.

SUBSCRIPTION RATES

Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.
Add $1.00 a year extra for foreign postage. Canada 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES

One page: One time—$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—$5.00. Per agate line $0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Sweden's Strong Position in Telephone Industry

AN illustration of Sweden's strong position in the telephone market of ten countries is provided by the annual report of the L. M. Ericsson Telephone Company and affiliated concerns. This gives the net profits of the parent company for 1922 as approximately $600,000 and a dividend of 5 per cent. was declared.

Among the subsidiary concerns the British company declared a dividend of 8 per cent. and the Finnish, 15 per cent. The plant in Petrograd has been nationalized and is still in control of the Soviet. In Austria and in Hungary the Swedish telephone industry has been particularly active. In Vienna the capital stock has been increased from 3,000,000 Austrian kronen to 150,000,000, and last year's dividend on the new capital was 50 per cent. on the old capital.

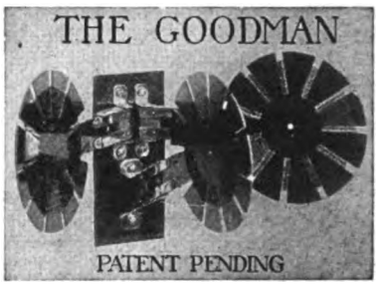
The Warsaw company has increased its equipment to 37,000 instruments, and last year's business showed good returns. The Ericsson-Mexico system now has nearly 17,000 subscribers, and the dividends were 12 per cent., the net profits amounting to more than $180,000. In Buenos Aires and in Entre-Rios, Argentina, the two newly organized affiliated concerns, while showing excellent prospects, have not been operating long enough to bring any great profit. The profits of the Dutch company have been added to the reserves, while the companies in France and America have been holding their own.

"RADIO TUBES REPAIRED"
Work Guaranteed
W. D. 11 and 12 U. V. 201 A **$3.25**
SIX VOLT TUBES
DETECTORS $2.75
AMPLIFIERS $3.00
Radio Tube Laboratories
770 Broad Street Newark, N. J.

FROM 180 to 700 METERS

Have you that range of selectivity? With a COAST COUPLER as part of your equipment it is easy. Why don't you try it? By sending $5.00 you will receive postpaid a COAST COUPLER and one of our famous hook ups which we guarantee will do all that is claimed for it.

DEALERS INVESTIGATE
THE COAST COUPLER COMPANY
245 East 7th St. Long Beach, California



The Niftiest Short Wave Tuner on the Market Only $5.00 & PP on 1 lb. Send for pamphlet.
L. W. GOODMAN
DREXEL HILL, PA.
The GOODMAN is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

Cram's Radio Broadcasting Map of United States and Canada
With all the new allocations and changes recently brought out. Scale, 100 miles to the inch; in two colors—Size 34x28.
PRINTED ON HIGH-GRADE MAP PAPER WITH ALL UP-TO-THE-MINUTE INFORMATION BY WHICH YOU CAN LOCATE ANY BROADCASTING OR HIGH POWER STATION. A COMPLETE INDEX OF THE ARMY, NAVY AND BROADCASTING STATIONS.
The Most UP-TO-DATE MAP out!
35c. (Postpaid)
THE COLUMBIA PRINT
1493 BROADWAY, NEW YORK CITY

HOOK-UP AND CIRCUIT HOUNDS

Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:

Reinartz circuit for 2 tubes	Jan. 13
Good 2 tube WD-11 Circuit for DX	Jan. 27
Satterlee Circuit	Feb. 3
G. W. May's Wonder Circuit	Feb. 17
Power Amplifier Circuit	Feb. 24
Reflex Circuits	Feb. 24
Flewelling Super Circuit	Feb. 24
Multi-tube Reflex Circuits	March 3
One tube Superregenerative	March 3
Lewis Three Tube Circuit	March 10
Regenerative Radio Frequency Circuit for 5 tubes	March 24
Haseltine Neutrodyne Receiver	March 31
2VK'S Transmitter circuit	April 21
Compact Universal Receiver	April 28
Stockalburg Pup receiver	May 5
Cockaday receiver	May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Rienartz	May 19

Any number for 15c. Any 7 numbers for $1.00. All 14 numbers for $2.00. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

WGY Players Reach Tremendous Audience

By C. D. Wagoner

A TURN of the dial gains you admission to the radio drama. Tune your radio set to station WGY and at least one evening a week you will hear an entire play, sometimes a comedy drama, a farce or melodrama.

For nearly a year now the General Electric Company station at Schenectady, N. Y., has been offering dramas by radio one night a week and during that period the little group of actors making up the WGY Players has had the largest audience ever before accorded dramatic offerings. Just how large that audience is is difficult to estimate. There are at least 2,000,000 radio sets in the country and of that number 1,500,000 are almost nightly within range of WGY. Many of these sets have loud speakers or extra phones enabling groups to listen-in. The number of people who have heard the WGY Players in the continuous run of 43 weeks is anybody's guess.

Edward H. Smith and a half dozen actors were engaged about a year ago to produce Eugene Walter's play "The Wolf" at WGY. It was something entirely new; it was contended by many that the radio audience would be unable to follow the play with any degree of interest because of the absence of scenery and because they could not see the players. Voice alone, it was contended, would not be sufficient to put over dramatic climaxes.

From the very first the radio drama was a success. Letters veritably poured into the station asking for more. Mr. Smith, formerly an actor and director on the professional stage, was engaged to produce one show a week.

This work was undertaken in a serious and thorough manner and for months many of the greatest successes of the stage have been going into the air reaching untold thousands who, but for radio, would never have had an opportunity of hearing the plays. During the past winter when farmers in many parts of the country were snowed in, cut off from the mails, the village and in many cases their nearest neighbors, radio programs went out to relieve their loneliness. The farmer, the woodsman, the keeper of the lighthouse along the Atlantic coast, were enthusiastic in expressing their appreciation of the dramas.

Mr. Smith and his players have pioneered in the art of the radio drama; they have had to develop a new technique. It was found necessary to make occasional changes in play manuscripts especially where a climax depended upon sight for its appreciation. The entrance to or departure from a room by one of the characters had to be indicated by sound, as a closing door. A bell helps somewhat in announcing a newcomer to the invisible stage. Various sound devices were created to produce atmosphere. A telegraph key and an imitation of an engine whistle were simulated by devices similar to those used on the stage.

The performer was greatly handicapped at first because he had depended a great deal upon the presence of his audience. Facial expressions were no help in interpretation; strong emotion could be conveyed only by vocal tone. To help the performer to a realization that his work was heard and appreciated WGY requested the radio audience to write their "applause" and this they have done by the thousands. The radio actor now "sees" his audience but an audience made up of all conditions of men, and finds inspiration for his work in applause, not of hand-clapping but words written.

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it. Buy your "B" Batteries direct from Manufacturer. No old stock batteries, but fresh tested batteries, with a 100 per cent. efficiency, at the following low prices, which are 50% less than list price.

	Large	Medium	Small
22½ Volt plain	$1.25	$1.00	$0.70
22½ Volt variable	$1.38	$1.13	$0.75
45 Volt plain	$2.50	$1.75	——
45 Volt variable	$2.75	$2.00	——

Any other type of battery made to order. Send Money Order or Order for C.O.D.

ROSENDAL & CO., 2 Stone Street, New York

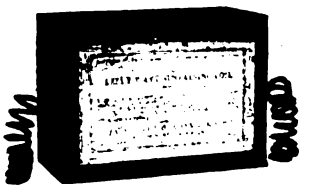
KELLY WAVE SUSTAINING COIL

Eliminates Aerials, Loops and Danger from Lightning

Fit Inside Set

The Kelly Wave Sustaining Coil will work perfectly in any tube set. The coil being sealed under a vacuum, it eliminates STATIC and all interference.

Price $4 Each



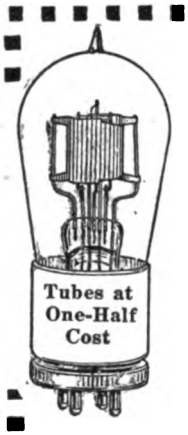
Makes It Portable

Simple to connect. One lead to terminal marked aerial, the other to A or B battery—That's all.

Dealers, write for special terms.

Manufactured by

JOS. GELB COMPANY, 250-258 West 54th Street, New York



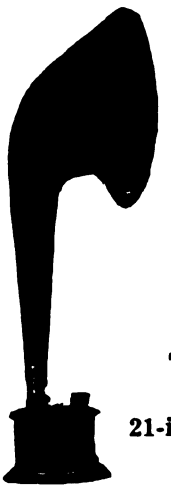
It has happened to all of you in a fraction of a second!

WHEN that filament burns out, at least $5.00 goes with it to put the set in operation again. WHY not save nearly one-half the cost of a new tube by sending us your burned out tube to be repaired? We REPAIR EVERY TYPE of tungsten wire filament receiving tube. All our tubes are TESTED and GUARANTEED to function as well as when new.

All tubes returned P. P., C. O. D.

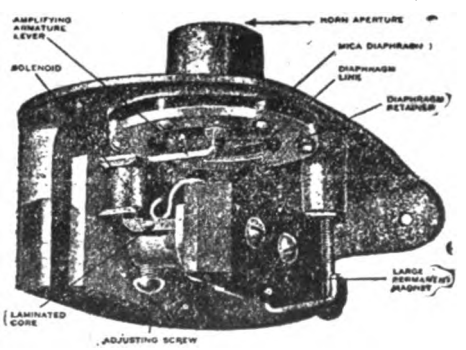
HARVARD RADIO LABORATORIES

BOSTON P. O. BOX 1781 MASS.



The only device of its kind in the Radio field

The Trinity Loud Speaker



TYPE "A1"

$25.00

21-in. Fiber Horn

Type "B" $12.50

Study the illustration carefully and you will understand why it produces full, clear, natural tones with perfect reproduction of all vocal and instrumental music. May be used with phonograph. No storage battery required.

The Trinity Loud Speaker is an instrument that combines the best qualities of a phonograph reproducer in combination with electro magnetic principles best fitted for radio amplification. Absolutely perfect reproduction of all music and speech without distortion. The volume may be regulated from that required for a room in your home to a tremendous output that can be heard hundreds of feet out of doors by simply increasing "B" battery voltage. No storage batteries required. The instrument is of a heavy duty type and is guaranteed fully by the manufacturers.

Ask your dealer for demonstration—if he cannot we can.

TRINITY RADIO CORP.

168-"B" DARTMOUTH STREET BOSTON, MASS.

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These People Make Bakelite, the Well Known Insulating Material

A group of employees at the plant of the General Bakelite Company, Perth Amboy, N. J.

Interesting Broadcasting Coincidence

WITH nearly 600 radio broadcasting stations in the air, many of them at the same time, it is not unusual for an operator to pick up two or three stations at the same time. Then begins the delicate task of tuning out all but the desired station, a task frequently impossible and always trying to the temper.

It is most unusual, however, for a fan to secure dual reception and discover that both stations are playing the same tune in the same key and tempo.

This occurred Tuesday evening, May 22, at 8.21 o'clock. A Providence, R. I., radio fan recently wrote WGY, the Schenectady station of the General Electric Company that he had heard the Radio Four sing "Dixie" from WGY at the same time that WEAN, the station of the Shepard Company in Providence, was sending out a phonograph record of "Dixie," a banjo solo with piano accompaniment. Part of the letter follows:

"Just once you faded out and WEAN was playing a banjo solo with piano accompaniment, 'Way Down South in Dixie.' What was our surprise to hear your minstrels come in on the same song, in the same key and same tempo and together, the two companies so many miles apart, finished the verse and chorus."

The log of WGY showed that the Radio Four had sung "Dixie" on the night and at the time given by the correspondent and R. F. Shepard, vice-president of the Shepard Company has reported that his station broadcast the same number at that time.

Special Church Services from WGY

WGY will provide special Sunday evening religious services from the studio in Schenectady, N. Y., during the months of July and August when few churches are holding evening services. The speaker Sunday night, July 8, will be the Rev. W. E. Compton, pastor of the Mont Pleasant Reformed Church. At 9:30 o'clock in the morning the services of the First Methodist Church will be broadcast.

Dr. Sigel Roush, lecturer, journalist and traveler, will give another of his series of travelogues. His subject Monday, July 9, will be "A Trip Through India." The lecture will be divided into three parts.

Two one act plays, "A Wall Street Romance" and "A Minuet," will feature the program of July 10. Thursday night will be farmers' night at WGY. W. W. Norton, of Hartford, N. Y., will give an address on "The American Farmer and His Problem." At 10:30 o'clock, the late Friday evening concert, talent supplied by the Dolgeville Exchange Club, of Dolgeville, N. Y., will appear.

Fifty-two issues for $6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

D. X. FANS

Send your name with type of set for details regarding the RaDioXor—the sensation of 1923.

WILLART SALES CO.
110 West 40th St. New York City

COMPLETE LIST OF BROADCASTING STATIONS
Appeared in Radio World Dated June 9, 16, and 23

Get these three copies and you will have the latest list of broadcasters published. 15c. a copy or the three for 45c. Or you may start your subscription with any number. RADIO WORLD, 1493 Broadway, New York.

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD 1493 *Broadway, New York City*

Please send me RADIO WORLD for ..... months, for which please find enclosed $.....

SUBSCRIPTION RATES:
Single Copy .....$ .15
Three Months 1.50
Six Months 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year to Foreign Postage; 50c for Canadian Postage.

.....

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AN ATTRACTIVE BINDER FOR RADIO WORLD

The publishers of Radio World have at last succeeded in getting a binder that will securely hold a full volume of this publication (26 numbers).

This binder is securely made, is attractive in appearance, and each copy can be added weekly without any difficulty.

This Radio World binder will be furnished to our readers at the reasonable price of

65 cents each

(Sent parcel post prepaid.)

Address Sub. Department

RADIO WORLD

1493 BROADWAY NEW YORK

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LATEST BROADCASTING MAP FREE to RADIO WORLD SUBSCRIBERS

The latest radio broadcasting map of the United States and Canada, containing all the new allocations and changes, is offered *free* to subscribers for Radio World who send in their subscriptions within the coming four weeks. This map is printed on fine map paper stock and has just the information you want regarding broadcasting stations throughout the continent, including army and navy stations.

If you are already a subscriber you can get this map by renewing your present subscription now.

Send direct to this office or you may subscribe thru your newsdealer who can send your subscription direct to us.

Use the coupon attached.

RADIO WORLD FREE MAP SUBSCRIPTION BLANK

Radio World,
1493 Broadway, New York.

For the accompanying $3.00 please send me Radio World for six months (26 numbers) beginning with issue dated .....and also, without any expense to me whatsoever, the latest radio map as advertised.

Name .....

Address .....

City and State.....

If you wish two maps, one for yourself and one for a friend, send $6.00 for a yearly subscription and the two maps will be sent to different addresses if you wish.

Radio and the Movies in Canadian Rockies

IN addition to being the first motion picture company to use aeroplanes in an actual story woven around the Canadian North Woods, the Cosmopolitan company, making the motion picture "Unseeing Eyes," has the distinction of having introduced radio in the Canadian Rockies. During the filming of scenes in the rugged country around Banff, Lake Louise and in the Selkirk Range members of the company were kept in contact with the outside world through the medium of radio.

When Director Griffith left for location in the Canadian Rockies he arranged for the transportation of a powerful heterodyne set. Through it messages were received from as far off as Los Angeles. Lionel Barrymore, Seena Owen and other members of the company soon became great radio fans, and listened in every night.

According to Director Griffith messages were received from KHJ, Los Angeles; KSD, St. Louis; WOR, Newark, N. J.; WJZ, Newark, N. J.; CFAC, Calgary, Alberta, and many other sections of the United States and Canada. "Unseeing Eyes," adapted to the screen by Bayard Veiller from Stanley Weyman's famous romance, is rapidly nearing completion.

Memorial Scholarship Man Takes First Honors

ARTHUR MARTENS, whose eligibility for entrance to Carnegie Institute of Technology at Pittsburgh was questioned because he had never attended High School, was graduated as honor man at the recent commencement. He stood first among 120 students who received enginering degrees.

His entrance application was accepted only after a special plea of C. S. Coler, manager of the Educational Department, Westinghouse Electric & Manufacturing Company at East Pittsburgh, his preparatory work having been under Mr. Coler in the Westinghouse Technical Night School.

The University of North Carolina reports that another Westinghouse scholarship man, H. C. Klingenschmitt, stood No. 1 in seven studies and No. 2 in one study for the year just closed.

Both of these men attended college as a result of being awarded War Memorial Scholarships by the Westinghouse Electric & Manufacturing Company. Several such scholarships are awarded every year to company employees and members of their families.

Subconscious Code Practice

LEARNING the code while you are sleeping may be perfectly simple for some one that is a good sleeper, but how in Tut's Treasures is a man who is a victim of insomnia ever going to learn the code that way?" was a question asked by one of our readers.

That's easy compared with a man who is a somnambulist. He would have to have a portable set strapped to his back.

MERRY CHRISTMAS!

We are installing eight tube superheterodyne: following new receiving sets, at thirty percent off, for immediate disposal:—

(a) **Melco Supreme:**—4 tubes. Magnificent.

(b) **Davidson:**—5 tubes. Quality with terrific volume.

(c) **Amrad** No. 3500 broadcast receiver:—4 tubes. Amrad in unopened case. Each set sells for $125.00 (less 30% to you). Finest commercial sets obtainable, for quality, appearance and remarkable performance. Send remittance to

Dr. Donald M. Gilderaleeve
109 Prospect Park West, Brooklyn, N. Y.

Cyclone

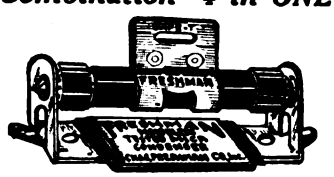
WORLD'S BEST

"A" and "B" BATTERIES specially built for your Radio Set in all types.
Highest quality GUARANTEED for DISTANCE, CLEARNESS, and LONG LIFE.

Standard Electric Novelty Co.
NEW YORK CITY
Best proposition for Jobbers and Dealers. Some territory still available for New Distributors. Write for details at once.

Freshman FIX-O

A Fixed Resistance Leak Combination—4 in ONE



Freshman Condenser
Leak Mounting
Freshman Fixed Leak
SAFE-T HANDLE

Price Complete 65c

Furnished in any value of resistance from ½ to 10 Megohms

Separate Condenser and Mountings 40c
Separate Leaks with Safe-T Handle 30c
At your dealers. Otherwise send purchase price and you will be supplied without further charge.

Chas. Freshman Co. Inc.
Radio Condenser Products
100 SEVENTH AVENUE NEW YORK

ELEMENTS OF RADIO TELEPHONY

By WILLIAM C. BALLARD, JR.
Assistant Professor of Electrical Engineering, Cornell University

This is a standard book on radio telephony, the work of a recognized authority.

It is accurate, simple, clear, reliable and strictly up to date.

The man with a technical background who wants to post himself on radio will find this exactly the book for his purpose.

The radio enthusiast will find in it an excellent presentation of fundamental principles and their application.

SENT POSTPAID ON RECEIPT OF PRICE, $1.50, BY

THE COLUMBIA PRINT, 1493 B'way, New York City

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

HONEY COMB COILS—35, 50 or 75 Turn, 40c, Each Mounted, $1.25; Special Windings to Order. Tapped Honey Combs, 3c per Tap. Crystals—Honest John's Old Fashioned Crystals. "Thunder Note" (Pyrites) and "Wonder Rock" (Galena). Tested, guaranteed and individually boxed. Each Crystal as big as a walnut. Biggest value in radio, 25c each. Small Pyrites or Galena Crystals for mounting, 75c per pound. Dealers and jobbers, write for special quotations. Factory agents wanted in some States. HONEST JOHN MFG. CO. (Dept. RW.), 1509 East 11th Street North, Portland, Ore.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 85, Le Roy, N. Y.

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FOR SALE—Regenerative Radio Receiver, used 30 hours. Reiser, Maybee, Michigan.

FORMS to cast Tin Soldiers, Marines, Indians, Trappers, Hunters, and my Air Pressure Cannon Machine. Moulds from $1.25 up to $3.50, casting 3 to 4 pieces at once. Write for catalogue. Ht. Schiercke, 1304 72nd St., Brooklyn, N. Y.

SELL GREBE RORK Amplifier with 2 VT2 tubes, $40.00. General Radio Wavemeter, type 191, $40.00. Other bargains. SCHUCK, 1411 Avenue A, New York City.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

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IF YOU WANT to save and make money, join National Supply Co. and buy anything in hardware line at reduced prices. Write immediately for particulars. Combination Box 254, New Alexandria, Pa.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

DYNAMO BUILDING FOR AMATEURS—Or How to Construct a Fifty Watt Dynamo.—By Arthur J. Weed. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings, showing the actual construction of the different parts. Price, $1.00. THE COLUMBIA PRINT, 1493 Broadway, New York City.

GET OUR PRICES on Plate and Filament Heating Transformers. L. Werts, 409 St. Julian St., Pekin, Ill.

SPRINGS made to order. Wright Bros. Spring & Wire Works, 5616 Huron St., Chicago, Ill.

AMRAD NO. 3589 BROADCAST TUNER, ONE-STEP RADIO, DETECTOR, TWO AUDIO—List, $125.00; sell, $80.00. Also complete specified parts Mawhinney circuit, includes panels, $50.00. Both sets never used. Struller, 6 Fuller Place, Brooklyn, N. Y.

MAGNAVOX TYPE R2.—Latest curves, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kans.

RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

TWO FOR THE PRICE OF ONE—Send $3.00 now for six months' subscription (26 numbers) for Radio World during the coming month and we will send you also Popular Radio or Wireless Age or Radio for six months without any extra charge. Or send $6.00 now and we will send you Radio World for one year (52 numbers) and Popular Radio, or Wireless Age or Radio for one year. These offers not good after July 23, 1923. If you are already a subscriber you can take advantage of this offer by renewing from the end of your present subscription. Sub. Department, RADIO WORLD, 1493 Broadway, New York City.

Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

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RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows, in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

The Rand McNally Radio Map of United States is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

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Try Radio World's Classified Department for your personal radio and other needs.

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Send us your name and address and say that you want to become our representative. We will show you how you can represent RADIO WORLD in your locality and at the same time make money for yourself. We would particularly like to hear from those who are handling the "Saturday Evening Post."

Address Circulation Dept., Radio World, 1493 Broadway, New York

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Many public libraries throughout the country are sending in their subscription orders for RADIO WORLD.

Librarians evidently have made up their minds that the visitors to their libraries are anxious to read articles about and see pictures of the latest developments in radio when they are news.

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Radio Enthusiasts Tie Up French Wire Service

"Listeners in" who daily hear the concerts broadcast by the Eiffel Tower wireless are accused of adding to the already great confusion and disorganization of the telephone and telegraph service of France, according to a press despatch.

Officials of the Telegraph Administration assert as an excuse for the irregular service that wires are being grounded everywhere by amateur wireless enthusiasts who do not know better than to connect their listening apparatus to telegraph and telephone wires.

The result, the officials state, is grounding and endless trouble for the Telegraph Administration. There is talk of issuing an order requiring everybody applying to the Administration for permission to install a wireless outfit to keep the official wires free.

American Radio Exports

DURING April, radio manufacturers shipped $224,195 worth of apparatus to foreign countries, an increase of $31,000 over March exports, according to compilations of the Department of Commerce. The total volume was over 64 tons, most of which went to Quebec and Ontario. These two provinces lead, receiving $65,325 worth, while the Virgin Islands stood second with $42,448 worth of apparatus. England was third and Mexico and Cuba followed. Thirty-four countries purchased radio equipment in the United States during the month, varying in value from $11 upward.

A report from the Netherlands shows that that country imported $59,280 worth of radio goods against imports valued at $27,300 during the first quarter of 1923. The trade in radio materials and equipment in the Netherlands has increased both in imports and exports over the first quarter of 1922 by several thousands of dollars.

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This Is a Special Offer for the Summer Only:

DO IT NOW!

Radio World for six months (26 numbers) is.....$3.00
Popular Radio at 20c a copy for six months would be..... 1.20

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Send us remittance for $3.00 and we will send you Radio World for six months and Popular Radio, or Wireless Age, or Radio (San Francisco) for six months, to one or different addresses, or send through your newsdealer.

This offer is good only for one month from date.

Take advantage of this offer today and send in the accompanying subscription blank. If you are already a subscriber you can take advantage of the offer by sending us $3.00 and renewing your subscription for six months beyond your present date of expiration.

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RADIO WORLD, 1493 Broadway, New York City.

Enclosed find remittance for $3.00, for which send me Radio World for six months, beginning with issue dated ..... and Popular Radio, or Wireless Age, or Radio for six months beginning with issue dated.....and it is understood that there is to be no extra charge of any kind. Please mail copies to the following address:

If you wish you may send us $6.00 for Radio World for one year (52 issues), and Popular Radio or Wireless Age or Radio for twelve months, both postpaid. This offer good only if mailed by August 10, 1923.

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Receives long waves in the parallel position; short waves in the series position; and waves of medium length by eliminating the condenser entirely.

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Series, Parallel, Direct-Ground

Patents Pending

Instructions for mounting and for wire connections given with each instrument.

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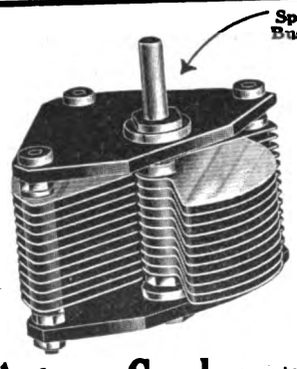

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"Jimmie" Listens In

(C. Fotograms)

"Jungle Jingles" were made expresely for this particular audience, who is shown heartily laughing at a joke cracked by one of the members of the Anti-Saloon League at a banquet of the Master Brewers' Association on the advent of the repeal of the Mullan-Gage Law. The illustration shows Jimmie all decked out in his best Sunday suit. He has two—his Sunday suit and his birthday suit.

Effect of the Weather on Radio

AS the warm days of summer come you will probably notice that some of the stations you have been hearing at a distance will come in weaker, and perhaps you will cease to hear some of them for a time. Like some of us poor mortals, says the director of Station WOC, the radio waves do not travel so far on the hot, sunny days as they do on the crisp, cool ones, and they prefer travel by night rather than by day. You can make an interesting study and at the same time contribute something to the knowledge of radio telephony if you will keep a record of the weather on days when your reception is exceptionaly good or when you have difficulties. Such a study, continued for a considerable length of time, may lead to the solution of some of your difficulties. It should be worth trying.

Try This Next Time

A READER has written a nice little note to us, telling us that we may read it and publish it at our own discretion. He states that he will not be responsible for the consequences, and will absolutely refuse to pay our hospital bills in case we come in personal contact with any of our readers. We never did like to take a dare—from any one; so here goes!

". . . And, furthermore, I have found out that if you start to chew on celery or a nice, hard apple while receiving a church sermon that you will not be bothered by any interference. As a matter of fact the sermon will not bother you either—if you chew vigorously enough."

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Something really new in Audio Amplification. (See article in RADIO WORLD, June 9, by C. White, on "A Super Amplifier.") We guarantee more volume and infinitely better quality than is possible with any other transformer on the market.

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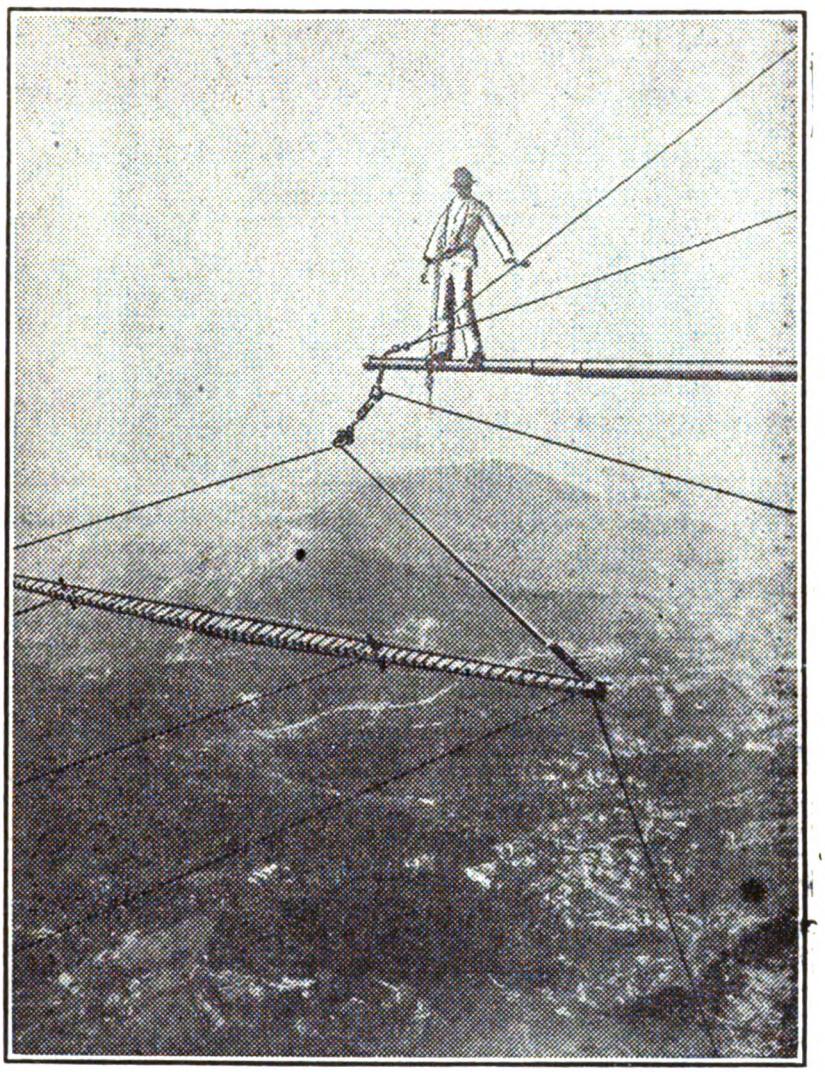

One Antenna Spreader of Station SPC

SPC, the radio telephone station recently installed by the Westinghouse Electric International Company, on the peak of Mt. Corcovado, overlooking the city of Rio de Janeiro, Brazil, enjoys the distinction of being the highest radio station in the world. The peak of the mountain is more than 2,100 feet above the city and from the station one may have a most wonderful view of the country for miles around.

While erecting the antenna for the station workmen were given many thrills and many times faced death when the slightest misstep would have meant a plunge into the depths below. The illustration herewith shows a workman standing out on one of the poles to which the antenna spreaders are attached.

SPC was the feature of American exhibits at the Brazil Centennial.

Radio World "Doubled Value of My Set"

EDITOR, RADIO WORLD: I desire to say that I am extremely well pleased with RADIO WORLD. Mr. C. White's Wave Trap, described in the issue of April 21, 1923, has doubled the value of my set; not only doing that for which it was designed, but giving me distance and clearing up all distortions of sound. Therefore I accept with alacrity your offer to send RADIO WORLD, 52 issues, and *Radio*, a San Francisco magazine, for one year for $6.00, in accordance with the enclosed slip.

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Remarkable Regenerative Receivers

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$20
Formerly known as Crosley Model V-c

This one tube receiver is astounding the radio world with its wonderful achievements. Stations more than 1000 miles away are being regularly copied on this set. In comparison to its price, there is no receiver on the market today to equal it in performance.

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THE PRECISION EQUIPMENT CO.
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Yours Sincerely **Greenwich Radio Co**

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SEND US THE NAME

OF YOUR RADIO CLUB

Also the names of your president and other officers. We want to add these to a list of radio clubs and officers we are preparing for publication in an early issue. RADIO WORLD, 1493 Broadway, New York.

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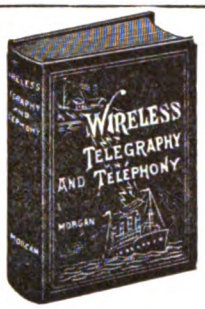
Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems



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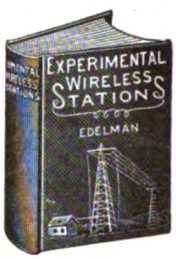
Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated.....PRICE $1.00



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Sleeper's Two Latest Radio Books

Two new and remarkably good radio books by M. B. Sleeper—one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a generative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for $1.00 and no extra charge for postage. The Columbia Print. 1493 Broadway, New York City.

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A Midget Set That Gets DX (See Inside)

15c. a Copy July 21 $6.00 a Year

RADIO WORLD

Title Reg. U. S. Pat Off.

ILLUSTRATED EVERY WEEK

RADIO HELPS YOU ENJOY YOUR VACATION IN THE WOODS

(C. Keystone Views) (C. Kadel and Herbert)

This composite picture shows how universally people are taking radio into consideration when they plan their vacations. The illustration on the left shows two California girls enjoying a concert while roughing it in the Arrowhead Woods, 70 miles from Los Angeles, California. On the right you can see Peggy Stahl and Rona Oakley getting their set ready up in the Adirondacks, in New York State. Miss Stahl is looking for a likely place to string her aerial, while Miss Oakley is giving the tubes a careful inspection after the ride over the rough mountain roads. No trip to the country is complete these days without a radio set, whether it be a simple crystal receiver or a five-tube set with loud speaker. No matter whether it is a camping trip to the woods or a vacation at one of the large country clubs or resorts, you are always in demand when you bring your receiving set.

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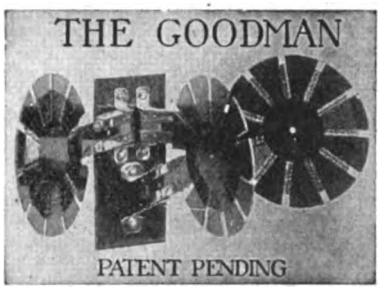

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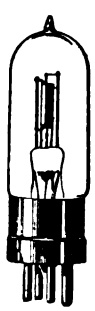

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Anybody Can Now Talk to Everybody by Radio

A NEW possibility and another utility of the radio was disclosed at Boston last week when it became desirable for a young man who was away on his honeymoon to return home at once, says an editorial writer in the New York *Times*. His mother had been taken desperately ill, and was pathetically eager to see him, perhaps for the last time. All that was known about the young couple was that they were "somewhere in New England," for, after the manner of their kind, they had veiled in deep secrecy the destination of their nuptial journey. They went away in an automobile and purposed to do all their traveling in it, stopping wherever fancy decided and staying there only as long as they pleased.

With no fixed address, even in their own minds, the prompt finding of the honeymooners would have been, until recently, impossible. Now it could be done simply and easily, and was. Nothing more was required than the "broadcasting" of a message to the bridegroom, telling him the facts. It reached without delay the secluded inn at Lost River, N. H., where he happened to be, not because it was sent there, but because it was sent out of Boston in every direction.

This is "paging" of a sort not even imaginable a few years ago, and obviously in the same way practically anybody in the more civilized parts of the world who wants or is willing to be found can be told without much loss of time that somebody desires to see him. Such calls will reach the far expanses of the ocean as well as of the land, for there are few of either, nowadays, that do not contain at least one instrument for receiving radio dispatches.

And before long, probably, the paging message can be an audible summons—one of spoken words, directly understandable and with the speaker's voice recognizable by the receiver. Then will the once all-conquering element of distance receive a stunning blow and give up the fight.

Already it is possible to get into direct oral communication with a considerably larger fraction of the earth's inhabitants than commonly is realized. Probably there are not more than 1,000,000, if as many, of the 100,000,000-plus people in the United States who cannot be summoned to a telephone, their own or that of somebody else willing in case of need to take the trouble to serve a neighbor. In some cases it might take an hour, or even a day, to "get" the person wanted "on the wire." It would cost money if the distance approached the transcontinental, but the price would not be prohibitive when a serious emergency was to be met or important business was to be done.

There seems to be no present probability that the radio wholly will replace or diminish materially the use of either the telegraphy or the telephony that is done over wires, but radio certainly will supplement both to an extent constantly broadening as the years go on. The prospect is not wholly pleasant to those who cherish the privileges and rights of privacy—of getting completely away, now and then, from their fellow men and women—but on the whole the balance is in favor of progress and change. That is fortunate, for neither can be prevented, and we must make the best of both.

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Johnnie: "Building your own set, getting it to work and then selling it for more than it cost you and havin' the fella tell his friends that it was a bargain."

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

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A Midget Set That Gets DX

By Dick Roberts

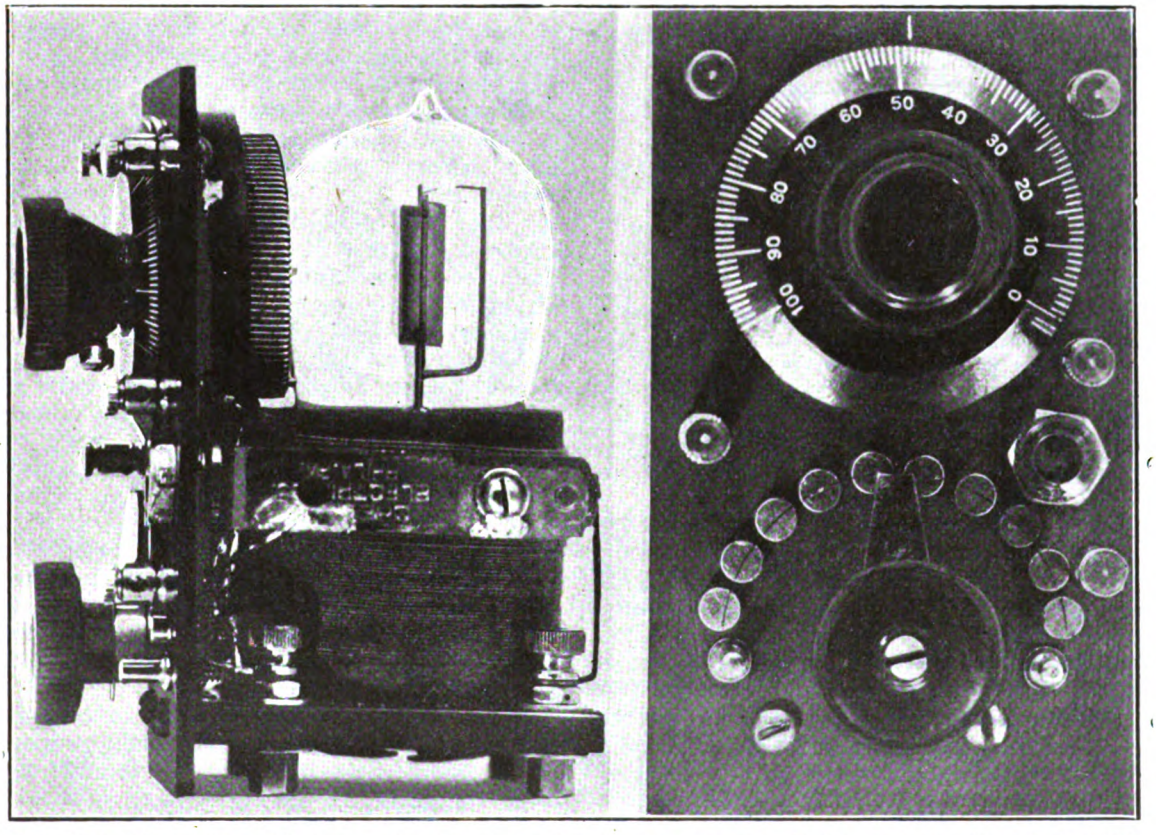
I HAVE seen several articles on miniature sets, all of them extremely practical and noteworthy. Being of an inquisitive turn of mind I thought I would try the construction of one of the "midgets" to see if they worked, and to satisfy myself that I could make it. Accordingly I determined to make it a tube set, and make it as small as I possibly could without seriously robbing it of its usefulness. The illustration showing the front view is the exact size of the entire set, so you can see for yourself my results.

The panel is 4¼ inches high by 2¾ inches wide and 2¾ inches deep, those being the exact dimensions of the tube socket base. All the apparatus is mounted on the socket and it was all constructed of standard parts.

The coil is wound of 80 turns of No. 28 SCC wire on a tube two inches in diameter. This tube is tapped every eight turns, making a total of 10 taps. The rheostat is a Fada (without vernier) the socket is a Signal and the jack is a Chelten.

The photographs were taken full size and show the construction and placing of all of the apparatus. You will note that the coil is placed over the base of the socket in such a manner that it takes up no more space than would naturally be taken up by the socket and tube itself. This is a feature that should interest the builders of small size sets.

The set uses no condensers or grid leaks whatsoever, none being used in the grid, the connection from the antenna going direct to the grid of the tube, and the plate connection coming direct to the under side of the jack thereby eliminating all wire in the plate side of the set.



Two views of the portable midget set constructed and described by Dick Roberts. The illustration on the right is a full size photograph of the complete set, and that on the left is a side view of the receiver showing all the apparatus mounted on the base of the socket.

I have used this set three nights after 11 o'clock and have heard the following stations loud and clear from Miami, Oklahoma, with no distortion, very little noise and very little trouble from interference. The stations heard were: WOC, WLAG, WHB, WDAF, WHAH, WSB, WGM, WOAW, WFAA, KSD, WMC.

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A Long-Range Crystal Receiver

By Kenneth Malcolm, A.I.R.E.

THE amateur radio operators of but a few years ago knew of the vacuum tube only as they read about it in the books and periodicals. It was at that time that the crystal set was in its full glory. And, considering the apparatus available, some really remarkable reception was carried on. The writer had a friend living in Brooklyn who picked up the Naval station at Honolulu a number of times, using nothing but a loose coupler set with a crystal detector. A distance of 1,500 miles was not considered uncommon by anyone. Ships at sea, using the comparatively insensitive carborundum crystal, were expected to, and *did*, pick up "press" over distances of 2,000 miles. Today, although not a usual thing, radio fans pick up broadcasting over distances of 500 miles.

The favorite type of set was of the loose coupler variety, for with this arrangement a greater degree of selectivity could be obtained than with the tuning coil. The set to be described is of this type, embodying all the best features of the loose coupler outfit, with the windings designed especially for the broadcast

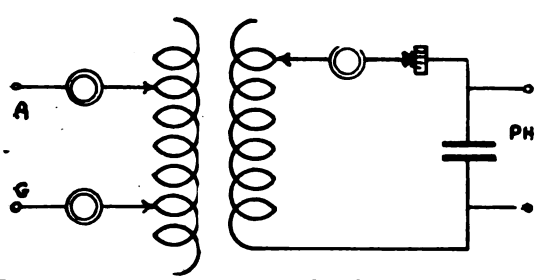

Fig. 1—Circuit diagram to be used with the set described. By connecting a variable condenser across the secondary, greater selectivity and easier control can be had.

wave lengths. Don't, however, imagine that a range of 500 miles is guaranteed—you might get it, but it is quite a sure thing that you will get every good broadcasting station within at least 30 miles.

Purchase an insulating panel ⅛-inch thick, 4⅝ inches wide and 4¾ inches long. Also two small rotary switches and 16 switch points, or taps. Another slightly larger rotary switch with 10 switch points is needed for the secondary. About 75 feet of No. 20 S. C. C. wire is needed for the primary winding and 100 feet of No. 26 S. C. C. wire for the secondary. Secure a set of detector parts, somewhat like those shown in the drawing. A phone condenser of from .001 to .003 mfd. capacity, two 3/16-inch round brass rods and a set of four binding posts complete the list of electrical parts.

Before the other work is started the panel may be carefully laid out, the holes drilled and the switches, detector and binding posts mounted. The drawings show plainly how this is done.

For the primary and secondary coils two tubes are needed. These may be of cardboard that has been impregnated with some insulting varnish, hard fibre, hard rubber, or one of the phenol condensation products One tube should have an outside diameter of 3½ inches, and the other an outside diameter of three inches. The walls should be about ⅛-inch thick in order to conform with the measurements of the other parts that will be mentioned. The primary, or larger tube, should be four inches long and the other 3½ inches.

Start the winding of the primary tube about ½-inch from the end and use the No. 20 wire. Wind on smoothly and evenly 72 turns making provision for taps on each of the first eight turns, and on every eighth turn thereafter. This should make 16 taps in all.

The winding on the secondary tube should be started about ¼-inch from the end and should consist of 100 turns of No. 26 wire. Provision for taps should be made at every tenth turn; this time the taps being taken from the *inside* of the tube. To do this, simply make a very little hole in the tube, where the tap is to come, and force through this hole a loop made of about an inch of the wire, then continuing the winding. Give the loop several twists to prevent it from pulling back through the hole.

Next we have to consider the wooden parts. Hard, well-seasoned wood should be used throughout. The base is 12 inches long, 5⅝ inches wide, and ¾-inch thick. A bevel around the top edge gives it a nice appearance. Two coil ends, 4¼ inches square, are needed for the primary tube. One of these should be ½-inch thick and the other must be composed of two pieces, each ¼-inch thick. A piece ⅜x4⅝x4¾ inches is needed for the top, and another piece ⅜x4¼x4¾ inches for the back. A piece ½x3x1½ inches is required for holding the ends of the coupling slider rods.

The only thing difficult in the construction of the set is making the tube fittings. However, if you have a little patience, a hand bracket saw will do the work very nicely. Find the exact center of one of the quarter inch end pieces by drawing its diagonals, and scribe a circle with a compass exactly 3¼ inches in diameter. This should be cut out with your saw, and if you are very careful, both the disk and the other part may be used. The disk should be mounted with two small brass screws on the exact center of the half inch end piece, as shown. Find the center of the other quarter inch end piece, and scribe a circle 3½ inches in diameter. Cut this out. The edge of this disk should be carefully smoothed with several grades of sandpaper, for it is to be used for the end of the secondary tube. Out of another piece of ¼-inch stock cut two disks 2¾ inches in diameter. Use glue and several small brass screws to fasten one of these to the center of the last mentioned disk. Glue and screw the two quarter inch end pieces together as shown in the drawing, so that the larger opening will be on the inside, or toward the tube.

Now the primary tube may be mounted. Place the end pieces on the tube and, when properly aligned, screw them to the base at the left end; the open end piece should be on the right side.

Next lay out and drill the secondary end piece for the switch and taps. The tap leads may now be soldered on and connected to the switch points, and the end fastened by means of several little screws through the tube. The disk for the other end of this tube should have a ¼-inch hole drilled through its center. Through this hole runs about a 12-inch length of double twisted flexible wire, which serves the purpose of connecting the secondary with the detector, the phone condenser and phone binding posts. A hole near the left hand end of the primary tube will allow it to pass through. After all the connections have been made inside the secondary, this other end may be fitted.

At some point near the bottom two parallel holes, about an inch and a half apart, should be drilled through both secondary end pieces, and to a depth of about

(Continued on next page)

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Dry Cell Eliminates Recharging

By Velma Carson

DRY cell vacuum tubes are beginning to displace storage batteries in radio receiving sets for the reason that they cost less and are more convenient to use. They are equally efficient for ordinary purposes.

Farmers are welcoming the use of dry cells because where they have no farm lighting system they have no way of getting storage batteries recharged unless they make a trip to town. And since this has to be done about every two months and costs at least a dollar it is a nuisance and an expense. Storage batteries cost around $15 apiece and only last, on the average, about three years. Besides the original investment a person has spent $36 in that length of time or $51 altogether.

You can buy enough dry cells for vacuum tubes for $50 to last ten years.

A dry cell costs 35 cents and can be used a hundred hours. There is no bother of re-charging or filling with distilled water every few weeks. It is put in the circuit, connected up, and then forgotten until it is ready to be thrown away.

A store of these tubes can be kept in reserve. They remain in good condition unused for six months. Nearly any electric shop in any small town carries them.

Another motive than economy prompts the use of the dry cell vacuum tubes and that is the convenience. Compared to the storage battery eight inches high and four inches in diameter the dry cell is only 2½ inches in diameter and 6½ inches high. It contains no acid likely to spoil things, is not heavy to cart, and does not take up a lot of space.

We can get more out of a dry cell by using it intermittently, i.e., with periods of rest in between periods of operation. We can get more out of it by keeping the current drawn from it as low as possible. What shall we do then? Be sure to turn off the filaments when the set is not in use. Do not run more than one tube from one cell. If you have two tubes, use two cells in parallel. When possible use two cells in parallel to supply one tube. One point to be remembered when connecting cells in parallel is not to use an old and a new cell. Their voltages will be different and will set up a local circulating current which will soon spoil the new one and will not improve the old one.

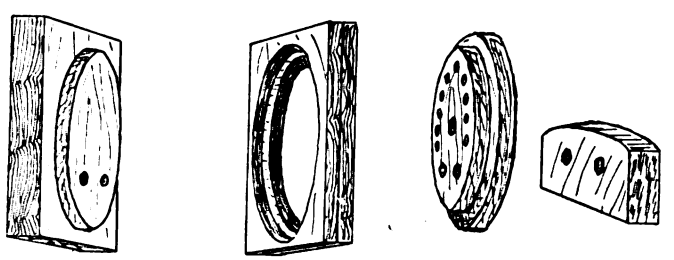

Fig. 2—Wood supports for the primary and secondary. They should be well seasoned. Dimensions are all given in the accompanying text.

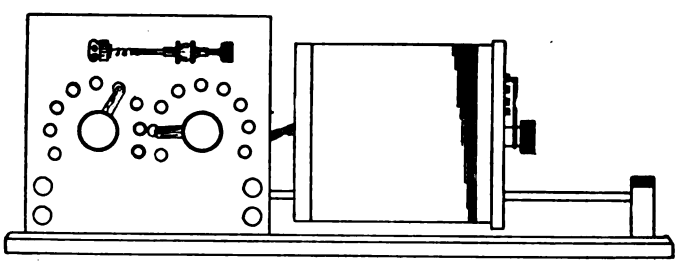

Fig. 3—The complete receiver as it should appear when finished. If care is taken in construction, and a good coat of alcohol stain applied, a very neat and serviceable instrument will be the reward.

(*Continued from preceding page*)

¼-inch in the left hand primary end piece and the rod support. Be careful to get these all in a perfect line, so that the rods may slip through easily. The rods may now be placed fitting them firmly in the left hand end, passing them through the both ends of the secondary and finally into the rod support. This latter piece may then be screwed to the base. If the work has been done properly, the secondary will slip into the primary tube very easily.

The panel may now be mounted and the connections made. The first eight taps of the primary coil are connected to the switch points of the left hand switch, and the other eight are connected to the right hand switch. One switch lever is connected to the aerial binding post and the other to the ground post. One of the flexible leads from the secondary is connected to one side of the detector and the other lead is connected to one of the phone posts and to one side of the phone condenser. The free side of the detector is connected to the other phone post and to the free side of the phone condenser. Be sure to solder all joints if you do not care to keep taking the set apart all the time.

The back and the top may now be fitted. If the wood parts have not been previously stained and varnished, it may be done now. After thoroughly sandpapering, apply some oil stain of the desired shade and color, and when perfectly dry, apply a coating or two of white shellac or transparent varnish.

The set will now be complete and the results that you get will be commensurate with the quality of the materials and the workmanship that you put into it. Also, a great deal depends upon the sensitivity of the crystal and upon that of the phones. Personally, I think that a good piece of galena is the best crystal to use, though some of the new synthetic crystals are very good.

The operation of the set is quite simple and, after a little practice, considerable proficiency will be acquired. By the use of the two switches on the primary, a single turn adjustment will be possible, affording the fineness of tuning that could be obtained with a slider. To tune in a station, put the secondary well within the primary, and adjust the detector as best you can—if you think it is out of adjustment. Set the secondary switch at some arbitrary value. Move the right hand primary switch until something is heard, then try to increase the intensity by moving the left hand switch. Next adjust the secondary switch and the coupling. If the results are not then satisfactory, and you think they can be bettered, play around with the detector a little. After a little experience, you will be able to make the adjustments almost intuitively.

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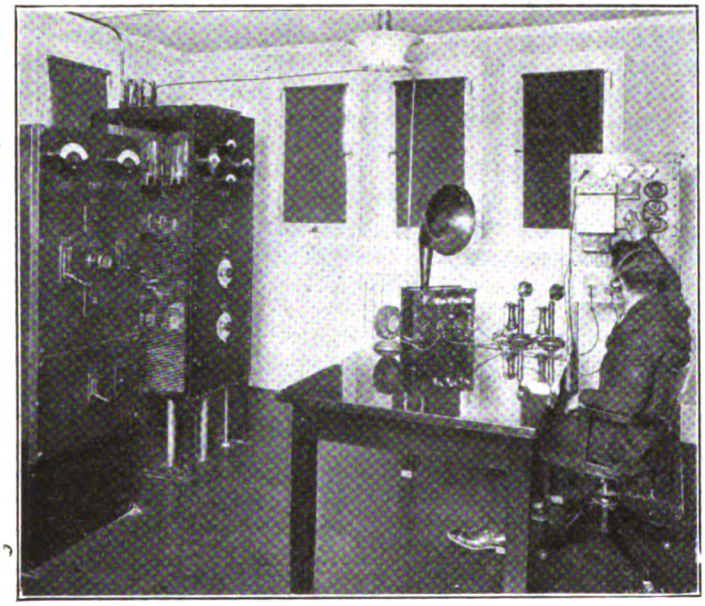
Col. Green's Radio Station WMAF

By C. W. Tucker

TO provide first-class radio programs for the people of New England and especially for his friends in and around New Bedford, Mass., Colonel E. H. R. Green has sponsored an innovation in broadcasting. Last Sunday night radio listeners heard the announcer say: "This is station WMAF, South Dartmouth, Mass. You have been listening to the



(C. Western Electric)

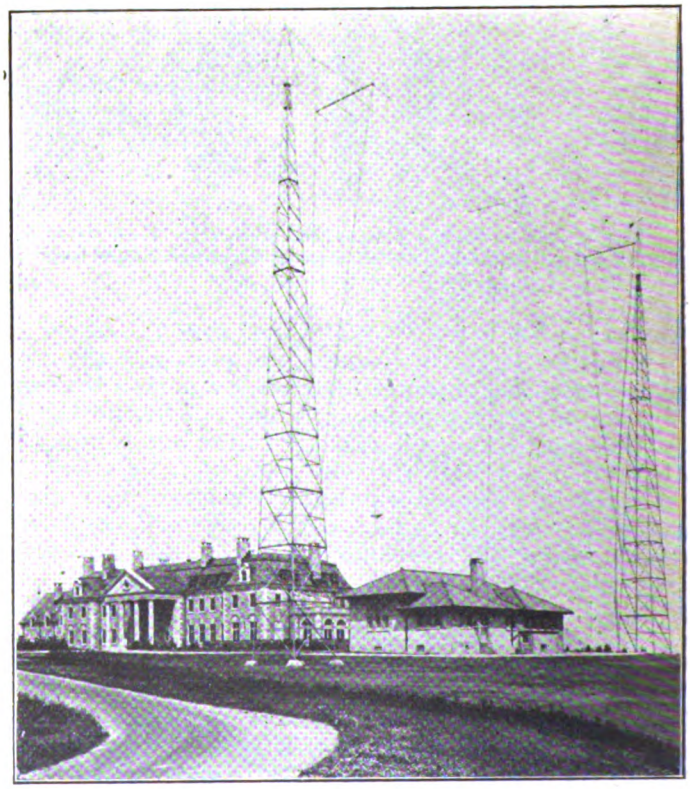
Apparatus room at WMAF. Here the operator regulates the volume of radio transmission and controls the entire power side of the transmitter.

musical program of the Capitol Theatre, 51st street and Broadway, New York City." Back of this simple statement is a modern miracle of electrical communication.

Realizing that New York was the center of artistic talent, Colonel Green arranged with the American Telephone and Telegraph Company that programs rendered for its station WEAF should be transmitted also over its telephone lines to the radio station on his estate, "Round Hills," where the speech and music control the radio set of WMAF just as if the performers were in the adjoining room. In the studio of WEAF is a sensitive microphone whose output is amplified through five stages and fed to a high-grade telephone circuit passing through Hartford, Providence and New Bedford. In each of these cities are test stations where the voice currents are amplified; and finally at Round Hills are four more stages, making a total of fifteen. The total amplification from transmitter to antenna reaches the enormous figure of ten billion times. Were it not that the energy of the transmitter is so tiny, and that much of the "gain" from each stage is dissipated in the intervening lines, all the power plants in the country could not furnish enough power to operate the last stage of amplification.

The building which Colonel Green erected for station WMAF is of tile and stucco, its lines harmonizing with Round Hills close by. Through the wide front doors one enters first a spacious reception hall, whose comfortable furnishings and broad fireplace make one feel at home. At the left are the office of the station manager, and the artists' retiring rooms. At the right, glass doorways lead to the studio, where local programs are produced. Blue brocade is hung loosely about the walls, so that reverberations may be damped to just the right degree. Deep chairs and a great davenport suggest that relaxation in which a performer can give the freest expression of personality.

From the main hall or the studio one enters the apparatus room, where stands the Western Electric 500 watt radio telephone transmitter. From the microphone in the studio, or from the telephone line from New York, tiny electric currents bearing the impress of the speaker's voice go through four stages of amplification and thence to the twin modulator tubes. Here they control the output of two oscillator tubes, thus sending out to the antenna a high frequency current whose strength is a faithful copy of the vibrations of the speaker's voice. The antenna itself, whence the other waves are radiated, is swung from two graceful steel towers 143 feet high. It consists of four wires, having a flat top 115 feet long, with lead-in wires falling 140 feet vertically to the transmitting apparatus. Power is furnished to the set at 14 volts for the tube filaments and at 1600 volts for the plate circuits, from a motor-generator set in an adjoining room. A radio receiving set is also provided, on which, as required by law, an operator listens constantly during transmission to pick up any distress calls from ships at sea.



(C. Western Electric)

Station WMAF showing the antenna equipment, the studio and transmitting room. Round Hills House, Col. Green's summer home, at Dartmouth, Mass., directly back of the tower.

When a program is to be produced, power is thrown on the set, and the wave length and antenna current are checked. Over a telegraph wire the New York control room is notified that all is ready. In New York, the announcer presses a button which makes the final

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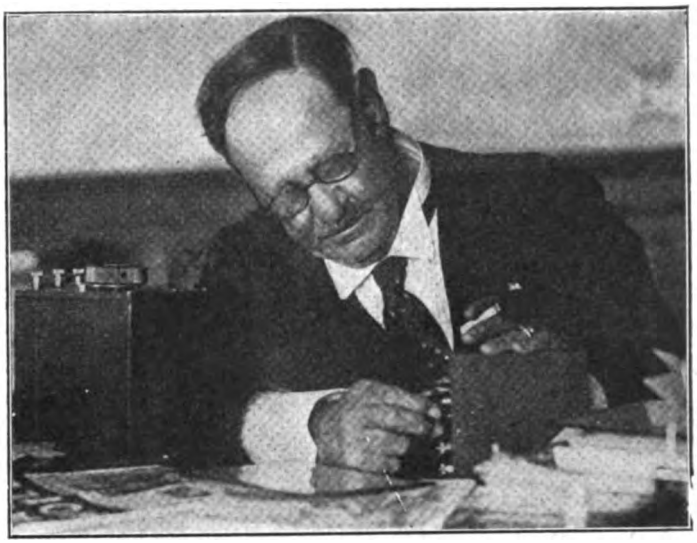
connection from the microphone, and then introduces the performer to the invisible audience. During the program, the control operator listens constantly by a head set or a loud speaker to what is being transmitted, and adjusts the degree of amplification so as to fully load, but not overload the transmitter.

To make these excellent programs available to guests on his estate Colonel Green has installed on the top of a water tower a group of loud speaking sound projectors connected to another amplifier, the whole being known as a Western Electric public address system. Near the water tower is ample parking space for automobiles and Colonel Green has invited his neighbors to drive in and listen to the programs, which will be clearly audible for a half mile or more. Plans are under way for the installation of additional projectors at Round Hills Light, a rocky isle off the shore of the estate, so that when the New York boat passes in the early evening the passengers may be entertained and farewell messages may be given to departing guests.

With the arrival of its big brother, the 100 watt Western Electric set of Colonel Green's station No. 1 will still render programs, but at less frequent intervals. It will be used to broadcast the work of local artists, and to transmit market and weather reports, local news, etc.

It is fitting that Round Hills should be the home of a great radio station.

In olden days the Master of Round Hills watched his own ships bearing cargoes of all lands to and from the port of New Bedford. Cargoes now arrive at Round Hills House—cargoes of good-will from radio listeners to WMAF's programs. As he reads these letters from lonely farms and frontier camps, from ships at sea, from those isolated by sickness, from his brother radio-



(C. Western Electric)

Colonel E. H. R. Green in his laboratory at Station WMAF.

fans, the Colonel is glad that Round Hills still shares in world-communication. Here, where sky and sea have long played hosts to the Four Winds, has arrived a new guest. Borne on wings of light, yet unseen; unheard, yet bearing tidings to all mankind—radio!

Mexico Generates Our Static— We Get Only the Echo!

THERE is no static in the northern states, and radio fans who think that Dame Nature is not giving them a square deal have a lot to learn. Even heavy electrical showers have little appreciable effect on radio. Such is the opinion of S. Kruse, technical editor of "QST," published by the American Radio Relay League. Mr. Kruse says that the nation's static has its natural element in the Mexican mountains and all the northern states get is the outer fringe.

These views are based on his radio experience of several months in the vicinity of the Gulf of Mexico. "What we get here is very second grade stuff," he says, "but in Mexico they have the real thing and the life of a radio operator on a Gulf steamer, or in a shore station, is well nigh impossible. The static growls and grumbles and raves and pops and at one time the Mexican operators at the old station in Tampico threw their phones on the floor and took to the monte, preferring chances with tigre and the culebra rather than to have their eardrums tortured any more by the tropical radio roar.

"This does not spoil reception for an evening now and then—it blazes away for six months at a stretch and during that time the owner of a radio set had better use it for a rabbit hutch. On a tug-boat off the Mexican coast I have heard static crash and bang so that it was totally impossible to hear any sign of a high-power station less than ten miles away—yet that same station was being heard in Boston at that moment without any trouble.

"A radiophone is simply helpless in that sort of a mess and communication is accomplished entirely with code—radiotelegraph. The Mexican government, the United Fruit Company and the U. S. Navy have strong stations around the Gulf and by using high power and repeating and repeating, they manage to get traffic through. But it certainly is tough on the operators, for they have to unravel a signal from a roaring boiler shop effect that is ten times as loud. At times they have to repeat each word five times, and if it gets extra bad and an important message must go through they repeat each letter as many as ten times.

"Nowhere is profanity so well developed as by these men—the tenth repeat of a message calls for remarks that would make a steamboat mate blush and, if there are many messages on the hook, the sender is likely to be talked clean out before he gets all the traffic cleared.

"Why do they stick? You would not ask if you had ever been in the South—one never likes the North again, one simply swears at the heat and the static and the dumbbell operator at the other end, and the infernal sand fleas and mosquitoes—and sticks.

"Where does the static come from? No one knows. It starts somewhere in the Mexican mountains—the radio compass proves that—but just where or why no one knows. Neither does anyone know why it disappears entirely in the winter and leaves wonderfully perfect conditions to compensate the man that has had the grit to stick. And finally no one knows why there are hours in each day when it lets up suddenly and then crashes out again with full volume.

"All we do know is that it does all of these things."

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The Handy Eye-Splice—How to Make it in Hemp Rope and Wire Cable

By Arthur S. Gordon

A NEAT antenna installation is one of the indications of a thorough working radio amateur. On the other hand, if there are frayed rope ends showing, if there are unsightly joints in the wire covered with a mountain of black tape, then it's a ten to one proposition that the radio enthusiast within is neither an ex-boy scout nor a one time sailor. The unseamanlike aspect of his aerial betrays his clumsiness in handling rope and wire. "Oh, what's the use?" ask many amateurs. But they forget that slipshod work in this respect is evidence of careless work in everything they do. The odds are against these amateurs ever getting a set to operate at top notch efficiency.

Splices in a radio antenna, after all, are merely efforts in the direction of maximum efficiency. In making

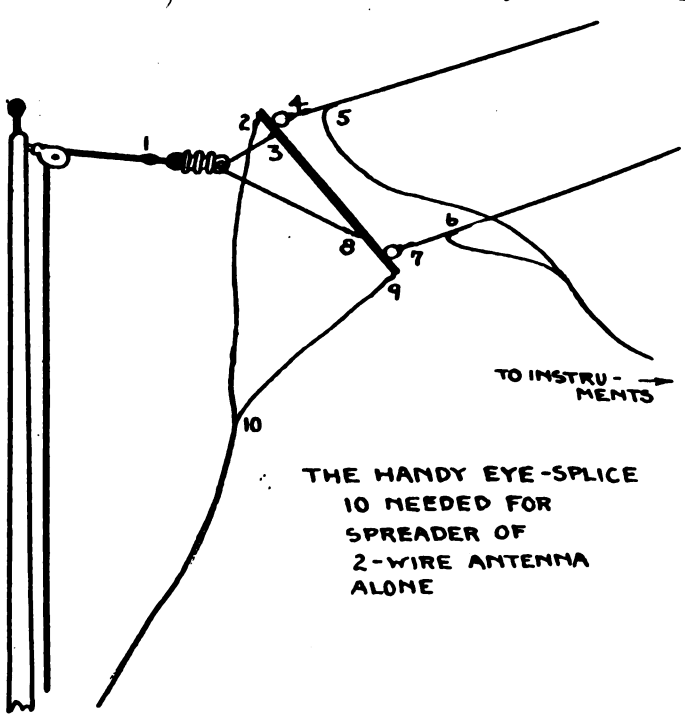

Fig. 1—Showing ten places where the eye-splice can be serviceably used in the erection of a first class antenna.

joints, some amateurs twist the two wires carelessly together and then rely upon the solder they pour over the joint to give them the strength and full electrical contact gained by a more painstaking procedure. In the long run, nothing could be more unsatisfactory. There is no trouble harder to trace than aerial trouble, the sinister part about it being that it shows itself not as a sudden and total breakdown but as a slow, steady deterioration of results. Splice joints, on the other hand, are not only as strong as the unbroken wire, but are electrically perfect. They will never pull out, are the last word in neatness and are especially recommended where the joint cannot be filled with solder, although where that procedure is possible, it is by all means desirable.

Contrary to the general impression, splices are easy to make. Rope, too, is easier to splice than wire, first because it has fewer strands and second because it is workable with the fingers. Boys with whom the author has worked have grasped the principle of splicing in less than five minutes and within ten minutes have been turning out almost perfect specimens of the art.

Perhaps the handiest splice for a radio amateur is the eye-splice, where the end of a rope or wire is turned back upon itself to form a loop or, as it is more properly called, an eye. Refer to Fig. 1. There, in the vicin-

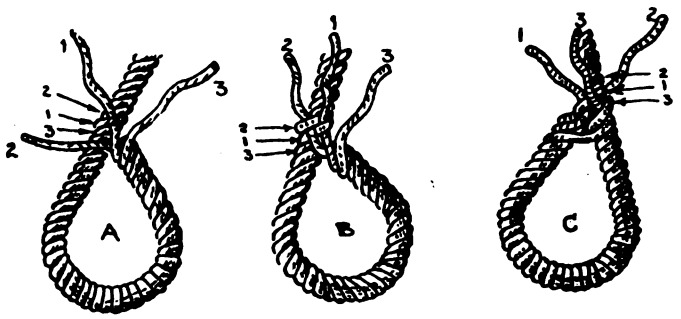

Fig. 2—The three stages of starting an eye-splice in rope. By referring to the text in connection with these sketches it is very easy to splice the toughest rope or the finest line.

ity of an aerial spreader carrying only two wires, are ten places where an eye-splice could be used to advantage. Think of what the ability to splice means to the radio amateur—to you—and then get a piece of three stranded rope and take an immediate lesson, not only in splicing, but also in one of the essentials of proper aerial construction.

Open out the strands for about four inches from the end and bend the rope into a noose with the open strand-ends crossing over the spot in the rope where the splice is to begin. Number the strand-ends 1, 2 and 3, according to the first step as illustrated by A in Fig. 2. Then make the tuck, under any strand of the rope as shown, and the resulting figure ought to resemble in every detail the sketch A. Strand-end No. 2 is the one which comes from behind the other two. It passes over the first tuck and under the next strand as shown by B, Fig. 2. In the meantime, No. 3 has been off on one side. Now turn the noose over, and for a moment, take hold of No. 1 and No. 2 and pull them a little apart. The rope will open, but one strand will remain conspicuously in place. This strand is the one

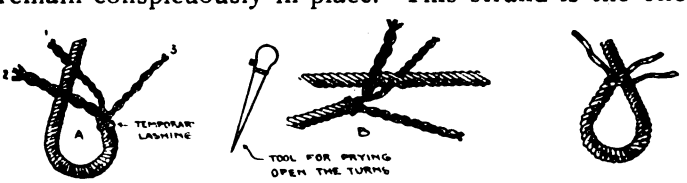

Fig. 3—Method pursued in the splicing of stranded wire. While not as easy as rope, the same method is used. The sharp pointed pricker is used to separate the strands and is a handy tool to work with. The illustration at the extreme right shows the wrong manner of splicing, due to the strand-ends approaching the rope from the wrong direction. Compare it with Fig. 2 A and notice the difference.

under which end No. 3 is tucked. Do not do the obvious thing, which is to tuck it under at once. This will spoil the splice. Instead, take it over the strand, turn around and come back under it, so that strand-end No.

(*Continued on next page*)

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Reflexing the Nite Owl Special

By J. E. Anderson, M.A.

IN RADIO WORLD for July 7 I described the new Nite Owl Special circuit, with which I have had exceptionally good results. Since that article was written I have extended the circuit by making use of the reflex principle, as shown in the accompanying diagram. This circuit gave most gratifying results.

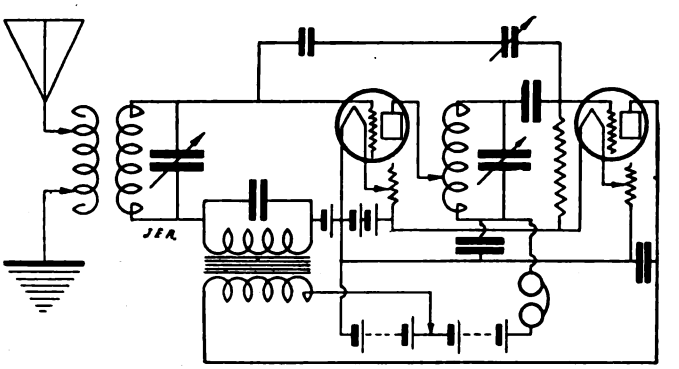
Since the apparent selectivity of a reflex circuit is not as great as the ordinary circuit it was found advisable to use double tuning in the input of the first stage. The antenna is tuned merely by varying the inductance of the coil, which is tapped at every turn. The coupling between the primary and the secondary does not need to be variable unless the added control is desired in a special case. With a little experimenting the best coupling readily may be found. The secondary tuning unit should have a range from 600 meters down to about 150. This is obtained with an inductance of .1 millihenry if the maximum capacity of the variable condenser is 1000 mmfd. and with .2 millihenry if the maximum capacity of the condenser is 500 mmfd. Thirty-two and 44 turns on a 3.5″ tube will give these inductances respectively with sufficient accuracy. The interstage coil should have about 60 turns of wire on a 3.5″ tube and it should be tapped at least every five turns.

The reflex circuit does not oscillate at radio-frequency as readily as an ordinary circuit on account of the resistance introduced into the grid circuit by the audio-frequency transformer. For this reason a larger portion of the interstage inductance coil may be included in the output of the first tube than is possible in the straight circuit described in RADIO WORLD referred to above, and the neutralizing capacity from grid to grid may be dispensed with. However, the circuit will frequently oscillate at an audio-frequency, which gives rise to the familiar howl or squeal. This may be eliminated by reversing the leads to the audio-frequency transformer, or by reducing the filament current, the plate potential or the grid biasing potential.

It is not advisable to increase the regeneration in the first tube to a point where the tube overloads, as this would cause the tube to act as a detector. This, of course, would result in an audio-frequency current in the output of the tube, which would interfere with the output of the tube which is due to reflexing the output of the second tube. These two audio-frequency components of the output of the first tube will usually be out of phase by an amount sufficient to cause considerable distortion in the received signals. For this reason, and the fact that the desired output of this two-tube reflex will be very large, only the larger tubes available on the market should be used.

If it is desired to increase the intensity of the signals beyond the point where the first tubes detects seriously, it should be done by making the detector tube regenerative. This is not shown in the diagram but it may be done by any of the ordinary methods. When this is done it is well to retain the neutralizing capacity from grid to grid to help control regeneration and to prevent re-radiation.

The by-pass condenser in the secondary of the audio-frequency transformer is not necessary as the capacity of the leads is usually sufficient. If it is used it should not be greater than 500 mmfd. A larger value would noticeably by-pass the audio-frequency currents and introduce distortion. The by-pass condenser in the primary of the audio-frequency transformer should be somewhat larger because the self capacity of the leads is much less, and it is necessary to furnish a low impedance path for the radio-frequency currents in the output of the detector, especially if this is regenerative. A suitable value is 1000 mmfd. A larger value than this would introduce a noticeable distortion in the output by shunting the high audio-frequencies from the audio-frequency transformer. If it is desired to tone down the high notes in the output and obtain a softer and more pleasing effect these by-pass condensers may be used for that purpose.



Reflex circuit incorporating the fundamental circuit of the Nite Owl Special. Note the neutralizing capacities which are used to prevent the tube from oscillating.

(*Continued from preceding page*)

3 comes out on the same side of the rope as No. 1. See C, Fig. 1.

The hardest part is over. Turn the noose over again, begin with No. 1 and continue the splicing. Pass over one strand and tuck under the next, always climbing up the rope and not down it. Do this with Nos. 2 and 3 in succession, and watch the splice grow under your fingers. Tuck each strand three or four times, pulling each tuck tightly. Then cut off the ends, roll the splice under the sole of your shoe a few times to smooth it off and the job is finished.

The single caution necessary in continuing the splice is not to mistake the strand-ends for the strands, when working the game of pass one and tuck one. If the rope is very thick, and you want the splice as neat as possible, taper down the strand-ends after the second tuck by tearing away some of the yarn strands.

Can you do it? How about wire, now, with seven strands instead of three? Well, it is just as easy. The soft wire used for aerial is very easy to handle, and the only tool needed is a miniature marlinspike, or what sailors would call a steel-pointed pricker. This may be any pointed piece of iron or steel, about the size of a leg on tinsmiths' pocket dividers. Unlay the wire as you did the rope and temporarily bind the throat with string, as shown in A of Fig. 3. Now twist the seven strand-ends into three and proceed exactly the same as with rope, with the small difference that you tuck under two strands instead of only one. When continuing the splices, pass over two and tuck two.

Eye splices are also used when joining a rope or wire end to the middle of another rope or wire. See B, Fig. 3. This is done when tapping off the lead-in wires.

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Station NAA Gets a New Voice

By Carl H. Butman

WASHINGTON, D. C.—Sea-going radio operators, many skippers and landsmen who listen in will note a change in the "voice" of NAA at Arlington 2,650 meters. The peculiar tone of the old Fessenden spark will no longer carry the time signals, weather reports and information of great interest to mariners. This famous spark set installed in December, 1912, was replaced on Sunday, July 8, by a new tube transmitter.

Operating on the same wave length, 2,650 meters, the new set will carry all the governmental broadcasting formerly done on the spark. Although its power is not quite as great, the range of the tube set by tests has proven a little greater than the old 100 KW spark. After eleven years of almost constant operation, the Fessenden set is to be retired from active service, and it is understood that it may be presented to the National Museum, where many radio experts believe it should have the honor accorded to the early locomotive of Baldwin and the Morse telegraph key.

Even before its installation in 1912 as the first high powered radio transmitting set in the United States, the Fessenden set was used in test work for nearly two years between the Plymouth, Mass., radio station and the Mackaranish station in Scotland by the Fessenden Company. A service of almost thirteen years is believed to be a record for even a modern radio set.

Besides the seafaring radio operators, many ship masters will miss the tone of the Fessenden spark. Careful skippers, it is said, check their chronometers personally in the radio shack when NAA broadcasts time twice each day. Trusting their operators in everything else, they prefer to put on the receivers themselves and count the dashes preceding the time signals at noon and ten p. m. noting the number of seconds fast or slow when the hour is designated by the long dash. Masters on the Atlantic and Mediterranean runs whose daily progress is noted in degrees of longitude, rely almost solely upon the time by radio, especially when the sun is not visible, and never miss an opportunity to check their ships' clocks.

In the old days before radio time transmission, east and west navigation was a more difficult task, since the mariners had no means of calibrating their time pieces while on a cruise requiring from ten days to two weeks. An accurate record of the chronometer's gain or loss in time per day had to be kept, and every observation had to carry the correction multiplied by the number of days out of port. This of necessity increased any unknown error and made navigation far from the accurate science it has become with the advent of radio time. Once in port, the master carried his chronometer carefully ashore to a reliable clock maker or watch expert and had it checked. The result was a correction in gain or loss in seconds per day and, as has been explained, necessitated daily corrections for exact time. Today there is no reason for the skipper to carry his timepiece ashore for calibration, except about once a year, since he can correct it twice a day no matter where his ship is.

While the time is sent from NAA primarily for Naval vessels, it is extended as a free service to all who sail the seas, besides all who listen in ashore. The new set will, it is believed, improve the time signals somewhat in audibility and in range.

State College to Teach Radio by Correspondence

CORRESPONDENCE courses in radio reception and transmission are now being offered by the Engineering Extension Department of Pennsylvania State College. According to N. C. Miller, head of the department, this new bit of extension service has been instituted in response to a large number of requests that have been received.

The course is divided into two parts, each with its own text and assignment pamphlets. The first part establishes principles and suffices for the ordinary student. It takes up common electrical phenomena, radio circuits, the vacuum tube, amplification, sources of power, transmission circuits, and applications of radio.

The second part is a continuation for those desiring advanced instruction and goes more thoroughly into the theory of electricity in order to prepare for a detailed study of electromagnetic waves, radio circuits, and apparatus for reception and transmission.

The purpose of the course is to correct the impression of mystery which surrounds radio and to show that the fundamentals of radio are not as mysterious as is commonly supposed. At the beginning it is assumed that the student has no knowledge of radio and very little of electricity, and the course is developed on that basis. Mathematics has been reduced to a few simple calculations and all technical terms are explained clearly.

"Despite the wide use of apparatus of all degrees of complication, there is still very little known by the average layman of the underlying principles of radio," says Professor Miller. "As a result much apparatus is installed without regard to anything but a blue print of a hook-up which as often as not does not give the maximum service for the outlay of time and money. In many cases the radio fan connects up apparatus at random, hoping by luck to strike on some scheme that will give him desired results. This is often fatal to valuable tubes and apparatus." Inquiries concerning the course should be sent to the Engineering Extension Department, State College, Pa.

Tuning Tips

IN order to get the maximum results out of any receiver the set should be retuned after a station is found. This allows all the circuits to be tuned in resonance. The primary circuit is the governing feature of any set and should be tuned carefully, after which the various other controls are tuned.

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"Original Radio Girl" in Her Own Studio

VAUGHN DE LEATH, so popular with radio fans through her frequent appearances before the microphone, is about to challenge the approval of radio audiences in a new role—that of studio and program manager of station WDT, New York City, now on the eve of opening for general broadcasting.

Rated among the leading women composers of the country, her songs and musical scores are known to all lovers of good music. As a recording artist, her phonographic records have had an enormous circulation, marked by an unusually even distribution over the entire country due, no doubt in a large measure, to the great range of her contralto voice (three octaves) and its quality of sympathetic appeal.

This young woman's remarkable versatility is further shown by her high rank as a piano player (not the mechanical kind) and by her success as director of her own band and orchestra of more than sixty pieces, as well as by her popularity as a concert singer and recitalist.

Miss De Leath was the first woman in the United States, and hence in the world, to broadcast vocal music for the benefit of the general public, with whom she has proved a decided favorite. She was the woman chosen for the first successful attempt to bridge the Atlantic by a woman's voice. It is for these reasons that she is so widely known as the "Original Radio Girl."

The radio-loving-public will now have an opportunity to observe her versatile talent further exercised for their benefit in the direction and management of her own broadcasting studio.

Miss Vaughn DeLeath, the "Original Radio Girl," is now manager of the studio at Station WDT.

The Radio Woman

A YOUNG lady who had recently acquired the bad habit of repeating things she had heard, was surprised to find out that she couldn't get any thrill out of telling her friends about the news she heard by radio, because they all read RADIO WORLD and kept up to the second on all the latest radio gossip and news. Then she turned around and sent in her subscription for RADIO WORLD and now keeps up to the minute on everything without having to worry that she will lose or miss anything.

* * *

It is one of the greatest of marvels to me what a wonderful influence a violin solo has on some people's nerves. I have a very good friend who drops in occasionally to see me and is one of the most nervous women that I think I have ever met. She simply cannot sit still. She must be moving all the time. She visited me one day last week and after watching her show her case of nerves, I suggested that we listen to the radio. As luck would have it, there happened to be a wonderful violinist on at the time and my friend just sat and listened right through, closing her eyes and not even moving. When it was all through, she remarked that it was wonderful. "If I didn't know that it was coming through that phonograph horn (my loud speaker) I would have thought that he was right here in the room. I love violin music—it seems to act like a soothing drug to me. I really believe that were he to play long enough he could put me right to sleep in a crowded train."

* * *

I think Friend Husband has bought more classical records since we have had our radio than he ever bought in his whole life before. He would hear a piece sung, or played, and if it appealed to him (and nearly every orchestral rendition of some famous suite was sure to) bright and early next evening, along would come hubby with two or three expensive records with that particular piece on. I don't think that we have bought more than a half dozen of those comical records since then, though before we used to specialize on them. How much nicer it is to hear Beethoven's "Moonlight Sonata" played by the Philharmonic Society Orchestra, than to hear "Yes, we have no oranges" by some comedian, that we will get tired of in no time.

Washington Signal Laboratory to Reopen

MAJOR J. O. Maubourge, Signal Corps, who was recently placed in charge of the Signal Corps laboratory at the Bureau of Standards, expects that experiments will start there on July 25th. Among the early experiments planned is the development of suitable terminal apparatus for transmitting General Squier's new universal alphabet. Since this code alphabet is intended to increase the speed of automatic transmission in cable, wire and wireless dispatches, the development of the necessary transmitting and receiving apparatus is necessarily somewhat complicated. With its perfection, it is understood that the Army Message Center located in the Munitions Building will then conduct some long-distance speed transmission tests, as soon as the apparatus can be installed there and at a distant station.

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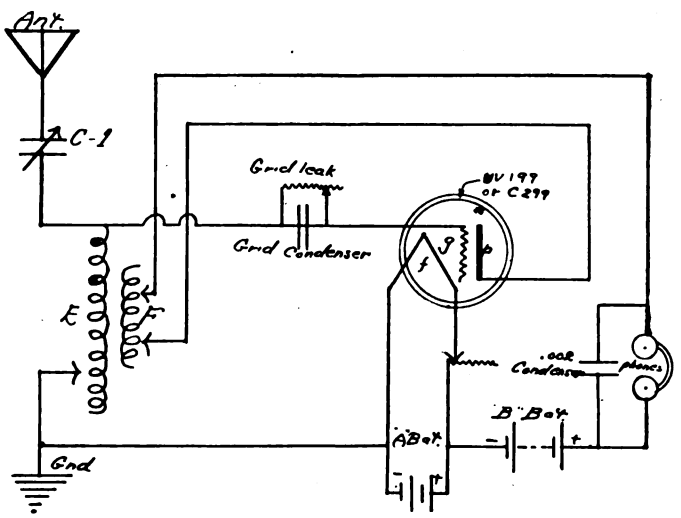
A Good U.V. 199 Hook-up

By C. White, Consulting Engineer

A FRIEND of mine recently said "circuits may come and circuits may go, but the single circuit regenerative is here to stay." Of course, the subject can be nobly argued pro and con but you have to admit that a circuit which would give more volume for a single tube than the single circuit regenerative circuit would have to go some. Then again, the circuit is very inexpensive to build and is almost fool-proof in operation. It is the utmost simplicity combined with the utmost reliability. I do not wish to go on record as saying that it is the best, for it is not, but I will say that for the amount of money invested and the results produced it is and will be for quite a time a leader. It can be constructed to be very compact and, while it is generally considered as a receiver with a radius of 500 miles maximum, it has been known to reach out as far as 2,000 or even more in cool weather. By using



A single circuit regenerative especially adapted to the new U.V.199. Note the fact that the tickler inductance is variable, which adds considerably to the ease in obtaining the critical regenerative point just before the tube "spills."

the new UV199 tube and dry cells throughout the maintainence expense is very small and quite negligible in comparison to that of more expensive outfits.

The circuit illustrated in the diagram herewith has been simplified to the greatest extent. No unnecessary controls have been included and the use of expensive variometers and variocouplers has been avoided. The tuning element E is wound with No. 22 D. C. C. magnet wire on a four-inch tube. This coil should have 60 turns in all with a tap at every 15. The coil F fits inside of the coil E and is therefore wound on either three or three-and-a-half inch tubing having 60 turns in all but differently tapped for switch points. One switch arm should allow connection to every 10 turns while the other arm should provide a fine adjustment allowing a tap-off at every turn. This means that the first 10 turns should be tapped by one switch for every turn in that 10 while the other switch arm should only tap off the entire coil in units of 10 turns. A similar arrangement is resorted to on certain variocouplers to obtain a fine and a coarse adjustment of the number of turns. The coil E is the main tuning inductance and the coil F is the tickler or regeneration control coil. Two switch arms control the number of turns of wire active on F while one such arm controls the number of turns in use on the coil E. The coils E and F should be wound with a piece of string between the turns in order to keep each turn from touching the next. By so winding the amount of distributed capacity of the coils is cut down. Very often a single circuit receiver is accused of being broad, but generally such trouble arises from the fact that there is a lot of capacity between turns of the inductance coil and the condenser employed has been of poor construction. Laboratory tests have definitely proven that a large number of condensers really act more like resistors in the circuit than condensers. Poor insulation and faulty construction are to be blamed. It is of the utmost importance to keep capacity out of a coil and resistance out of a condenser. I have constructed single circuit receivers bearing these facts in mind and have obtained very good selectivity—in fact, better selectivity than is possible with many double or triple circuit affairs that use poor parts.

I wish to call particular attention to the fact that the better the set is made the more important it will become to have a vernier condenser attachment on the condenser C-1, which is an 11 or 13 plate air variable. A 30 ohms rheostat must be used with the new tube in order to get a fine variation of filament current such as is necessary to control the detection. Failure of the tube to oscillate may be due to the fact that the terminal connection to the switch arms of the coil F should be reversed. A proper type of grid leak and grid leak condenser will play an important part in the successful operation of the outfit. A good variable grid leak would be a desirable asset to the outfit, as well as a good mica grid condenser. Do not forget to see that the movable plates of the condenser C-1 are connected up to the antenna and the fixed plates to the grid side of the circuit. By so doing you will avoid quite a bit of grid howl and body capacity effect when tuning in your set.

Ain't it a Grand and Glorious Feelin'?

WHEN you get the new set home, attach the aerial and ground, put on the batteries, plug in the phones, turn on the juice, turn the dials and hear nothing? Your heart stops beating for a five second space, you look at your connections, wiggle your jack and plug, look at your phones, look at your tubes and they seem all right. You know that something is wrong, but can't figure it out. It must work!

You try to remember if anybody ran into you while you were carrying it—and faintly remember a fat man bumped your arm on the car. Hurriedly you examine the connections only to find that everything is perfectly O. K.

Suddenly—a bright idea—you look at your B battery and find there is a loose connection.

OH, BOY—ain't it a grand and glorious feelin'?

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The Reasons for Trouble

THE average fan, when he first starts up of course reads loads of books on radio, and after hearing a million and one "Don'ts and Do's," is quite likely to question the validity of more than nine-tenths of them, because he does not see any direct bearing or reason for them.

He does not realize that experience is a wise but expensive teacher, and more than once is taught himself by his own experience just because he did not take the advice of others who have tried things and found out.

He will often boast that he receives long distances on a set that "hasn't a single soldered connection" not realizing that if he had soldered them he would have reached further. He thinks that soldering is a "bunch of bunk" and is simply specified because some fellow wants to make him work. Did he ever see a naval or professional set that "wasn't soldered"?

He burns his tube up as bright as he can without absolutely ruining the signals by distortion. The makers of the tubes may specify that a certain voltage should be used on the plate when it is used as a detector, but he puts on double the amount and thinks that he has "put one over" on the manufacturer.

He purchases a wonderful set, or makes one, and then puts up a poor antenna and to balance the bargain he connects the set to an equally poor ground and wonders why his set doesn't get the good results that are claimed for it.

He reads about some hook-up that "looks good." He makes it up and skimps on the expense by buying cheap parts, rushing the construction and then kicks when it doesn't turn out to specifications.

People wouldn't waste their time writing and experimenting and prescribing "Do and Don'ts" if there was no reason for it.

Think it over the next time your set doesn't satisfy you and see which of the ten and ninety commandments and rules you have violated.

Arc Transmitters Create Interference

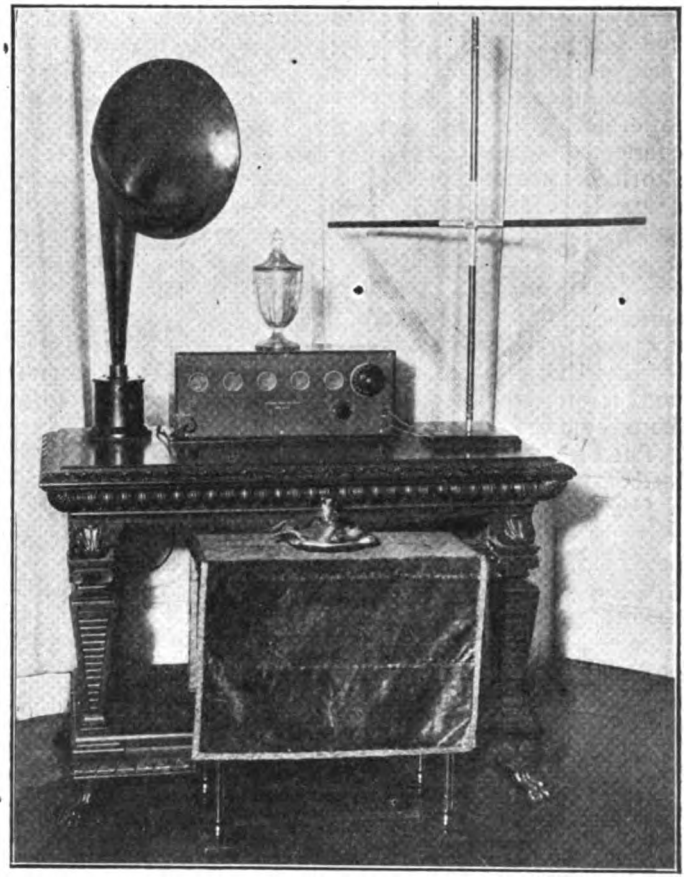
RECENT reports from the Navy Department indicate a very considerable amount of interference from mush and harmonics at all points within 200 miles of Pearl Harbor. Current transformer circuits will be installed on the Honolulu transmitters of the Navy within the near future, which will eliminate this interference it is hoped.

Naval experts admit that arcs and spark transmitters create a considerable amount of interference in their vicinity, unless special circuits are installed to reduce such interference. Transmitters of these types are being modified as rapidly as funds permit. On arc transmitters current transformer or similar circuits are being installed and spark transmitters are being replaced by tubes. Owing to the large number of transmitters operated by the Navy and the limited funds available, this work is, of necessity, proceeding slowly, but it is expected that the greater part of this interference will be eliminated during the next fiscal year.

Radio as An Ornament in the Home

YOU fans who take delight in showing pictures of sets with a dozen controls and a rheostat for every tube, take a look at the illustration below, which is the radio installation in the home of Dr. Donald M. Gildersleeve, 169 Prospect Park West, Brooklyn, New York. It is a five tube radio-frequency set using a loop antenna. The tuning is all accomplished by means of the condenser located at the right hand side of the set, and by swinging the loop in the direction of the desired station.

The set is conveniently located in the living room



An arrangement such as this makes a radio set an object of beauty as well as of service in the home.

of Dr. Gildersleeve's home, and will bring in long distance on a loud speaker such as is shown in the picture. The loud speaking unit is a Western Electric D10, and the set is a Davidson 2-R-S. It makes a handsome appearance, and we are told that it does some very neat work.

This receiving arrangement recently was entered for a prize that was to be awarded to the owner of the neatest receiving station, and it seems to deserve it, because it most surely is an artistic as well as utilitarian installation.

One Way of Doing It

If capacity effect is noticed when the antenna condenser is tuned, reverse your condenser leads. Where **a condenser is used in the ground** the rotary plates should be connected to the ground.

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RADIO PRIMER

By Lynn Brooks

WIRING THE RECEIVER: Some amateur builders of radio apparatus will spend hours drilling, tapping and finishing the panel and cabinet of a receiver and when that is all done will wire the set with any kind of wire they happen to have at hand, not caring whether half of it is wired with bus bar and the other half with flexible leads or anything that may be handy.

In the wiring of a set it must be taken into consideration that the leads should be as short as possible to make them, and they should have as little resistance as possible.

Another point that is important, but neglected, is the bunching of leads. Wherever possible, the leads on a receiver should not be bunched or connected together in a manner that will tend to bring several leads close together. Just because the diagram specifies that a connector goes from the plate to the phones and another from the plate to the antenna side of the inductance and there is still a third that goes from the plate to the plate battery side of the phones, is no indication that all the leads should run directly to the plate connecting screw of the socket. It is often possible to eliminate several inches of wire by simply connecting one wire in such a manner that all the other leads that tap off on it can easily be bridged by a single wire from one of the other leads, and thereby eliminate bringing more than one lead to any connector.

The insulation of the leads is also important. Where leads cross even, though not real close, it is best to slip a few inches of spaghetti or some other insulating material across them. Do not run leads parallel for any length.

When placing the apparatus on the panel, consider before you drill the panel, the way in which the apparatus will control the wiring scheme. You can ofttimes by simply placing the condenser or coupler to the other side of some particular piece of apparatus eliminate a long lead.

Where leads are to be connected to some movable apparatus it is best to use flexible leads and fasten them to the solid wire. This gives freedom of manipulation and eliminates all chances of broken leads in after time.

FINISHING THE PANEL: In the final appearance of a set, the shiny panel does not generally look as rich as the finished satiny sheen of a manufactured set. It is very easy to give that satin finish to a panel if a little care is taken in the work.

Before the apparatus is mounted, take a piece of No. 0 sandpaper and carefully rub the panel lengthwise, being careful to do this in long, straight strokes, working from end to end. Do this until the entire panel is dull and scratchy looking. Do not make the mistake of rubbing with a circular motion, but keep even with each edge of the panel. Then brush off the dust, get some fine steel wool, and repeat the process until the panel has a dull, smooth finish. Then soak the steel wool in light machine oil, or melted vaseline, and continue to rub it. After the entire panel has been rubbed, go over it again with a clean cloth on which is some more oil or vaseline, and finally rub the whole thing down with a clean cloth, taking all the excess oil off. The panel will now be found to have a nice dull satin finish, but if a higher finish is wanted, get some rotten stone and put it on a rag dry, and repeat the process above until it has a real high finish, always taking extreme care to rub the panel in one direction only, whether using the sandpaper or the rotten stone.

RADIOGRAMS

With the 2 k.w. arc and chopper installed on the S.S. "Eastern Glade" reliable night communication was accomplished on 600 meters from Durban, South Africa, to Madagascar for a period of over a month. The distance between the above mentioned places is approximately 1,200 miles.

* * *

Extension of the market news service of the United States Department of Agriculture, involving the establishment of one of the largest commercial leased telegraph wire and radio systems in the world, has been announced by the Department of Agriculture effective as of July 1.

* * *

The authorities of Westchester County, N. Y., last week sent out a general alarm for a negro wanted as a suspect in the murder of Dorothy Kauffman, a governess at the home of Magruder Craighead in Greenburgh, and had his description broadcast by radio from Station WRW at Tarrytown, N. Y.

* * *

The marriage is announced of Miss Jessie E. Koewing to Carlton Brown. Miss Koewing is known to thousands of radio fans, her pleasant voice having been employed at the WOR broadcasting station, Newark, N. J. Mrs. Carlton Brown has resigned from her activities with L. Bamberger & Co., who operate WOR.

* * *

An automobile was stolen from a motor company in Kansas and a few hours later news of the robbery was broadcast. In ten minutes a long-distance call from a farmer told the motor car dealer that a car answering the description he had picked from the ether had been abandoned in a ditch and a neighboring farmer had the car in his yard.

* * *

With the Model TF tube transmitter installed on the U. S. Cruiser "Omaha" reliable communication was obtained up to 1,200 miles by day on CW and up to 1,600 miles by night on ICW and voice. With the 20 k.w. arc daylight ranges of 1,800 miles were obtained while working vessels of the U. S. Fleet, and 2,000 miles while working shore stations.

* * *

Arthur Hammerstein is strong for the broadcasting of his musical shows. It is invaluable advertising, he thinks; but not so with the dispensing of his airs through the orchestras of the cabarets and hotels. He has instituted injunction proceedings against the band leaders of London to restrain them from playing the various tunes of "Wildflower."

* * *

Station WMAK, Lockport, N. Y., will discontinue broadcasting during July and August, except the weather and farm reports, which will be sent out on the 360-meter wave length at 11 A. M., Eastern Standard time. The station will be remodeled and alterations made in the transmitter during the summer. It will operate as a Class B station in September.

* * *

A daily radio service, direct from New York City markets, giving last-minute prices on farm commodities, has been inaugurated by the *American Agriculturist,* a farm journal, in co-operation with the Department of Farms and Markets and Station WEAF. The service will start at once and be given every Tuesday, Wednesday, Thursday and Friday at 10.50 a. m., Eastern Standard Time.

* * *

The Naval Radio Traffic Station at Cape May, N. J., has been closed and abandoned. The transmitter at that station was removed to the Radio Compass Station at Henlopen, the latter station becoming the compass control station for the group composed of Cape May, Cape Henlopen and Bethany Beach. Traffic formerly handled by the Cape May station will be handled by the radio station at Philadelphia.

* * *

Few American cities are so completely wired for electricity that they can provide their push-cart men and their sidewalk merchants with electric lights to hang over their stands at night. Japan does, and is rapidly approaching American universal and highly specialized use of electrical energy in her homes, factories and shops, according to a bulletin of the New York State Committee on Public Utility Information.

* * *

Dr. Louis Bell, the eminent electrical engineer, whose recent death was chronicled in Radio World, had a profound knowledge of wireless telephony among his many remarkable achievements. During the World War he was a member of the advisory committee of the Council of National Defense, and, with Norman Marshall, of Waltham, Mass., invented a system of signaling by ultra-violet rays which enabled dots and dashes to be transmitted invisibly to the enemy, but with accurate reception for several miles by troops provided with the proper apparatus.

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Amateur Radio Station as Powerful and Complete as a Commercial Plant

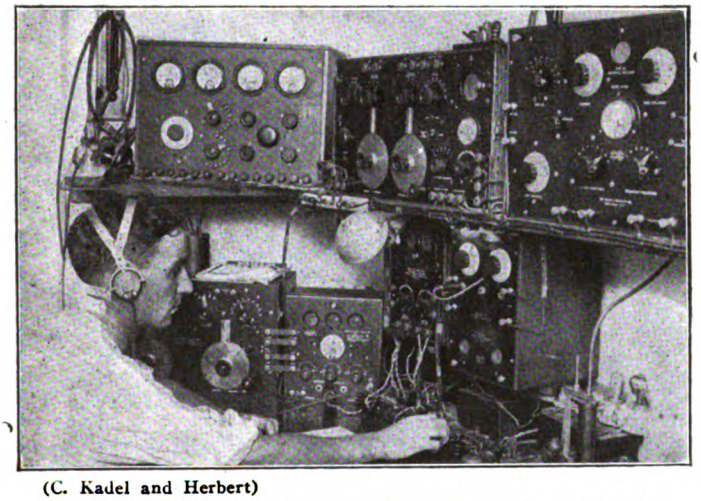
By Lynwood Cowen

CONSIDERING the tremendous strides made by amateurs throughout the United States during the past year, it is not surprising that some very fine and complete sets and stations have been established.

Heretofore all amateur stations have as a rule kept strictly to amateur practice, but it remained for Walker P. Inman, a New York amateur and owner and operator of station 2BGM to establish a station that is far away and above anything else in that line.

To illustrate this fact, take a look at the transmitter which is used for phone work. It uses four 250 watt tubes with an input of 1,000 watts. The antenna radiation is six amperes and, with this transmitter, Mr. Inman has reached Honolulu and many other points as far away.

The receiving side of the station is a most complete one, and the number of receiving sets would make an operator on a ship turn green with envy. There are three sets used, one a navy receiver with a range of from 300 to 8,000 meters. This is mostly for commercial work, as it is on these wave lengths that the receiver is most efficient. A Universal receiver with a range of from 150 to 25,000 meters is also used both for short and long wave work. A radio compass receiver for use with a loop is also used. Any one of these sets can be used simply by plugging them in the circuit, and if desired from one to four stages of amplification can be employed. The illustration shows the sets. There is also a 20 watt transmitter used when communication by CW and ICW is desired. This is shown on the upper shelf in the left hand corner.



(C. Kadel and Herbert)

Receiving equipment at Station 2BGM with the owner operating. The 20 watt CW transmitter is located on the upper left hand shelf. The compass receiver with three-stage amplifier is located directly under it on the table while the naval receiver and universal receiver are directly over the two-stage amplifiers directly in front of the operator.

(C. Kadel and Herbert)

Powerful 1000 watt transmitter used at Station 2BGM for broadcast work. Walker P. Inman is shown inspecting one of the 250 watt tubes. This transmitter is of the exact type used in commercial stations and current for the operation of the set is derived from a special generator set. With this set six amperes can be put into the antenna.

Handy Equipment

MANY times when an amateur is building a set, or considering the construction of one, he wonders just what tools are necessary, or maybe he has some few tools, and could do better if he had more. It does not require many tools if you intend building a set from parts that you purchase, but the list given below will help the average fan in making his set:

One breast drill; one set of drills for above in 16ths from 1/8 to 9/16ths; a try square—12-inch blade; 1 good steel punch; 1 hacksaw and set of blades; 1 soldering copper; 1 compass; 2 screwdrivers—1 12-inch and 1 four-inch; 1 pair of electricians sharp nosed pliers; 1 pair of side cutting pliers; 1 small vise; a sharp knife; 1 table clamp.

Station WCAP Opens

WCAP—note the initials—the new Washington station of the Chesapeake and Potomac Telephone Company, opened on July 4 by broadcasting a duplicate of the New York Telephone Station, WEAF, program carried by land lines to Washington. This simultaneous broadcasting in two cities was very successful, except for a slight hum due, it is believed, to the long land line from New York to Washington. Operating under a temporary license, it is understood that WCAP will continue to broadcast the New York program occasionally until arrangements for the local program are completed. The station is licensed in Class B on 469 meters and has a power of 500 watts. It is Washington's first B station, although Arlington, NAA, is actually in this class.

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The Beautiful, the Practical and the

(C. Photonews)

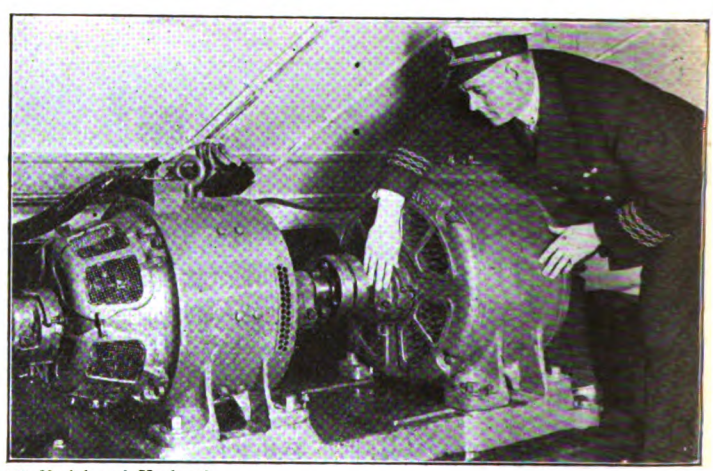
"Mother, may I go in to swim?" "Yes, my darling daughter. Take your radio set along, and sit right near the water!" That's the way we would sing the ancient ditty, after seeing Sara Mullen enjoying a sun bath at Rye Beach, New York, with the aid of the new portable Radiola which operates on dry cell tubes with neither antenna nor ground.

Captions by Robert L. Dougherty

(C. Kadel and Herbert)

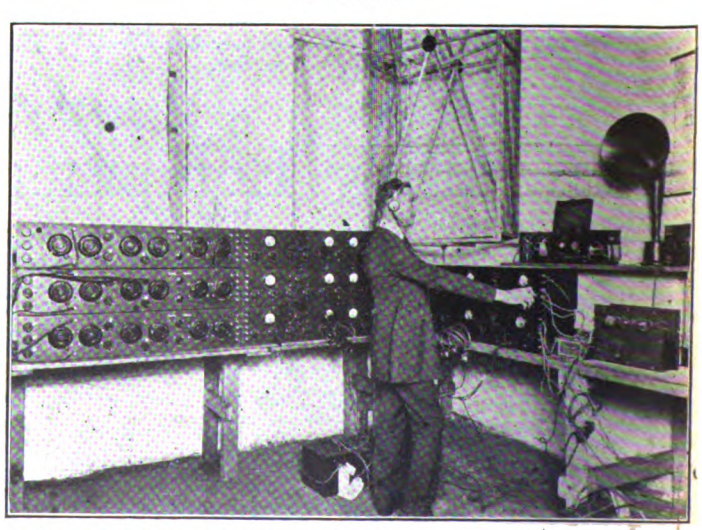
Automatic radio is being installed in Parisian cafes, hotels, and other public places. The idea is proving quite popular with those who do not own sets. Regular time schedules are kept by the broadcasters, and by simply removing the phones from the hook and listening at the right time a full-fledged radio concert may be had without the necessity of tuning in.

Station WLW, of the Crosley Manufacturing Co., Cincinnati, recently gave a series of swimming lessons by radio. The lessons were broadcast by Stanley Brauninger of the Y. M. C. A. from the station, and by means of a portable set with loud speaker children were instructed in the natatorial art. This is the first time anything of the kind has been attempted, but the fact that it met with success shows to what lengths radio instruction can be utilized.



(C. Kadel and Herbert)

Chief Radio Officer Pickerell of the S. S. "Leviathan" inspecting the motor-generator set of the world's largest ship after using the set for tuning and testing. This generator set is the largest installed on any commercial vessel for the purpose of communication. The power furnished by this plant is enough to light a good sized town, but instead of doing that it is used to furnish power to keep this floating city in touch with both continents during its voyages.



A laboratory equipment that would make the average fan's envy mount to the skies. Five ten-tube super-heterodyne receivers all blasting at the same time bringing in five distant stations. This experiment was recently carried out by the Experimenters' Information Service in New York City in order to determine the amount of interference that had to be overcome by the use of antennae that were centrally located, and the amount of interference that could be overcome by the use of specially designed loops.

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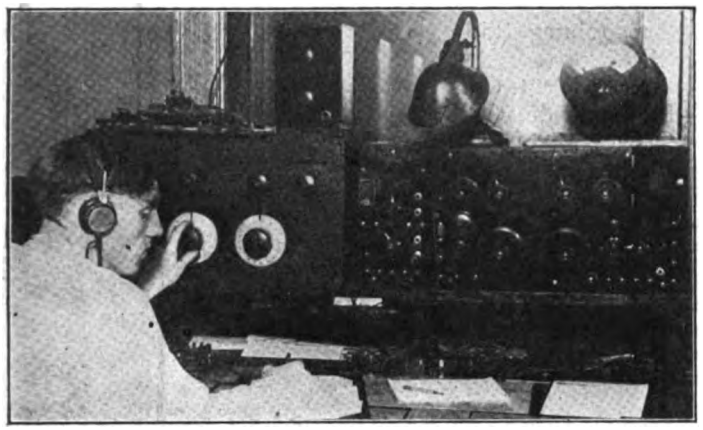
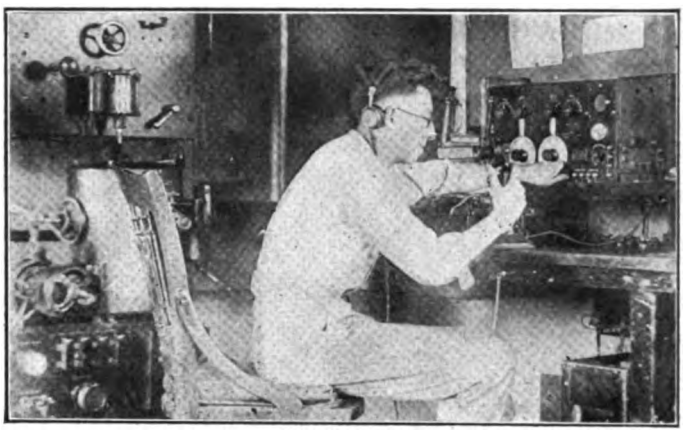
e Scientific Phases of Radio News



(C. Photonews)

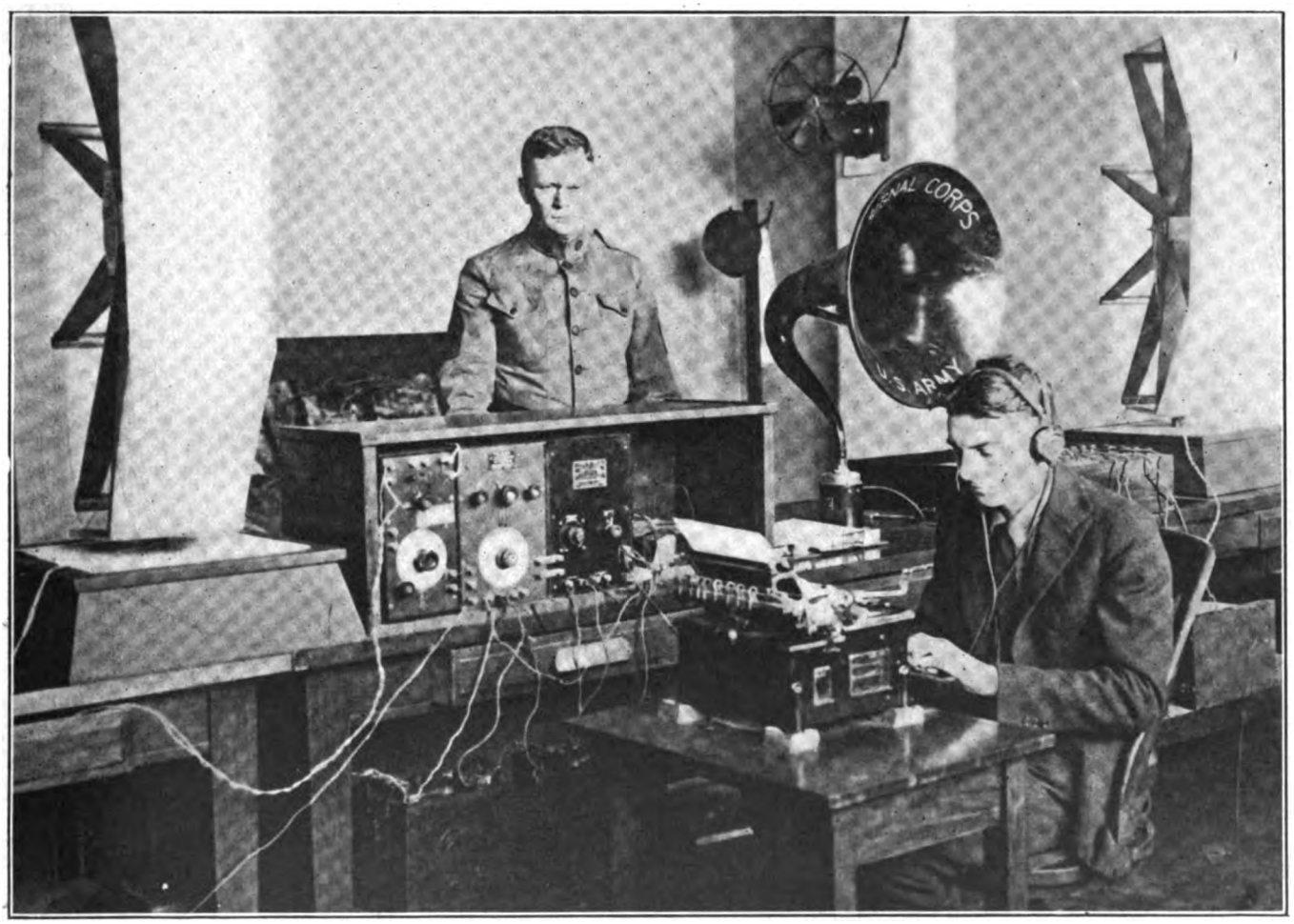
Here is the station that many amateurs and broadcast listeners hear just when their sets are bringing in the DX. It is the spark station WNY, at Bush Terminal, Brooklyn, N. Y. The illustration shows Ernest Engelder, chief operator, using the heterodyne receiver.



(C. Fotograms)

The Air Mail Radio Station of the Post Office Department, located at Garden City, L. I., which keeps in touch with the 'planes and landing fields all over the country. It is by means of this station that the service can be kept in touch with all delays and maintain the air mail service at its highest efficiency.

U. S. Signal Corps Uses Loops to Receive European Stations in Washington, D. C.



(C. Fotograms)

The U. S. Signal Corps' radio station at Washington, D. C., does all long-distance receiving of European and foreign stations by means of loops and heterodyne receivers. This eliminates the necessity for long antennae and large inductances, as the loops are wound with the necessary amount of wire to allow reception over ranges of 15,000 to 30,000 meters, and tuning is done by means of the condensers across them. It is in the laboratory of the U. S. Signal Corps that Brig. Gen. Squier, Chief Signal Officer, conducts all his experimental work, and where the wired wireless system was perfected.

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Peak in Broadcasting Stations Reached

By Washington R. Service

WASHINGTON, D. C.—Broadcasting is apparently slowing down slightly, based upon the number of stations in operation today. The peak of the curve of this popular service was reached in May, when 591 stations were on the lists of the Department of Commerce. On June 30th, there were 573—18 less stations than in May, although there were 115 more than in June, 1922.

The broadcasting service which started in September, 1921, with three stations, rose slowly during the last months of 1921 to 28 at the end of the year, but in March, 1922, it began to climb by leaps and bounds, reaching 576 in December, 1922. January showed a loss of six stations but this was made up in February when a total of 581 was reached. Following the National Radio Conference in February, 1923, this figure increased until the peak of 591 was reached in May. With the allocation of wave lengths, a number of stations have dropped by the wayside; fifty stations were deleted in June, more than in any other month since the service was undertaken.

On June 30, the total of 573 stations was distributed as follows: Class A, 203; Class B, 42; Class C, 327; and Class D (development) 1.

During the month of June, 31 new Class A stations were licensed and one Class B. 27 C's were transferred to Class A, and two were granted Class B licenses. In June, one Class A station stopped broadcasting, and 49 Class C's, on 360 meters were deleted.

The stations dropped from the records of the Department during June follow:

One Class "A"

Call

WLAS—Central Radio Supply Co., Hutchinson, Kansas.

49 Class "C"

Call

WPAA—Anderson & Webster Elect. Co., Wahoo, Neb.
WHAE—Automotive Electric Service Co., Sioux City, Iowa.
WOAS—Bailey's Radio Shop, Middletown, Conn.
WPAY—Bangor Radio Laboratory, Bangor, Maine.
WAAL—Beamish Elect. Co., Minneapolis, Minn.
KNN—Bullocks, Los Angeles, Cal.
WPE—Central Radio Co., Inc., Independence, Mo.
KFEB—City of Taft, Taft, Cal.
WCN—Clark University, Worcester, Mass.
WEY—Cosradio Company, The, Wichita, Kansas.
KDZG—Cyrus Pierce & Co., San Francisco, Cal.
WEAX—Daily, T. J. M. (Argenta), Little Rock, Ark.
WRAK—Economy Light Co., Escanaba, Mich.
KSL—Emporium, The, San Francisco, Cal.
KDZX—Glad Tidings Tabernacle, San Francisco, Cal.
WKAL—Gray & Gray, Orange, Texas.
WLK—Hamilton Manufacturing Co., Indianapolis, Ind.
WCAC—John Fink Jewelry Co., Fort Smith, Ark.
WMAX—K & K Radio Supply Co., Ann Arbor, Mich.
KFGB—Leewenthal Bros., Pueblo, Col.
WRAM—Lombard College, Galesburg, Ill.
WWAY—Marigold Gardens, Chicago, Ill.
WOU—Metropolitan Utilities District, Omaha, Neb.
WFAW—Miami Daily Metropolis, Miami, Fla.
WEH—Midland Refining Co., Tusla, Okla.
WCAB—Newburgh News Printing & Pub. Co., Newburgh, N. Y.
KFCB—Nielsen Radio Supply Co., Phoenix, Ariz.
WKAK—Okfuskee County News, Okemah, Okla.
WGAM—Orangeburg Radio Equipt. Co., Orangeburg, S. C.
WHAW—Pierce Elect. Co., Tampa, Fla.
WKAH—Planet Radio Co., West Palm Beach, Fla.
WCAW—Quincy Electric Supply Co., Quincy, Ill.
KJJ—Radio Shop, The, Sunnyvale, Cal.
WKN—Riechman Crosby Co., The, Memphis, Tenn.
WEAV—Sheridan Elect. Service Co., Rushville, Neb.
KNI—Smith, T. W., Eureka, Cal.
WFAZ—South Carolina Radio Shop, Charleston, S. C.
WOAU—Sowder Bolling Piano Co., Evansville, Ill.
WRAC—State Normal School, Mayville, N. D.
WFAC—Superior Radio Co., Superior, Wis.
KFBH—Thomas Musical Co., Marshfield, Ore.
WMAG—Tucker Elect. Co., Liberal, Kansas.
WPO—United Equipment Co., Memphis, Tenn.
WSAV—Vick, Clifford W., Radio Construction Co., Houston, Tex.
WMAR—Waterloo Electrical Supply Co., Waterloo, Iowa.
KFBD—Welsh, Clarence V., Hanford, Cal.
WAAY—Yahrling-Rayner Piano Co., Youngstown, Ohio.
KOA—Y. M. C. A., Denver, Col.
WIAE—Zimmerman, Mrs. Robert E., Vinton, Iowa.

List of Broadcasting Stations Licensed Week Ending June 30

Call	Station	Frequency Keys	Wave Length, Meters	Power, Watts
K F I U	Alaska Elect. Light & Power Co., Juneau, Alaska.....	1330	226	10
W S A N	Allentown Radio Club, Allentown, Pa.	1310	229	10
K F I V	Broyles, V. H., Pittsburg, Kansas	1250	240	20
K F H Y	McEwan, R. S., Trinidad, Col.	1240	242	50
W S A Q	Round Hills Radio Corp., Dartmouth, Mass.	1070	280	100

Transferred from Class C to Class A

Call	Station	Frequency Keys	Wave Length, Meters	Power, Watts
W Q A E	Moore Radio News Station, Springfield, Vermont.....	1090	275	50
W S A T	Plainview Elect. Co., Plainview, Texas	1120	268	20

One new Class B license and three new Class A licenses were issued by the Department during the week ending July 7.

New Class B

Call	Station	Frequency Keys	Wave Length, Meters	Power, Watts
W C A P	Chesapeake & Potomac Tel. Co., Washington, D. C.....	640	469	500

New Class A

W K A D	Looff, Charles, East Providence, R. I.....	1250	240	10
W S A R	Doughty & Welch Elect. Co., Fall River, Mass.	1180	254	10
K F I X	Reorganized Church of Jesus Christ of Latter Day Saints, Independence, Kansas	1250	240	500

Transferred from Class C to A

W N A C	Shepard Stores, Boston, Mass.	1080	278	100
W R A Y	Radio Sales Corp., Scranton, Pa.	1070	280	100
K F B U	Thomas, Bishop N. S., Laramie, Wyo.	1060	283	50
K F F R	Kirk, Jim, Sparks, Nev.....	1330	226	10

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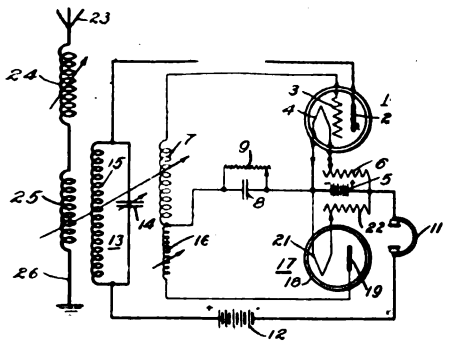
Latest Radio Patents

Wireless Receiving System

No. 1,455,768: Patented May 15, 1923. Patentee: J. Slepian, Swissvale, Pa.

This invention relates to methods and means for amplifying currents and particularly to wireless receiving systems.

In its broad aspect, the object of my invention is to provide an improved



Receiving system utilizing cascade detection and selective feedback.

wireless receiving system which has highly desirable operating characteristics and which is responsive to signal impulses radiated from either damped or undamped wireless transmission systems without the customary heterodyning step.

More specifically, one object of my invention is to provide a receiving system which admits of an extremely high amplification of received signal impulses.

These and other objects of my invention will be apparent from the following description of the nature, the mode of operation and the advantages of my invention.

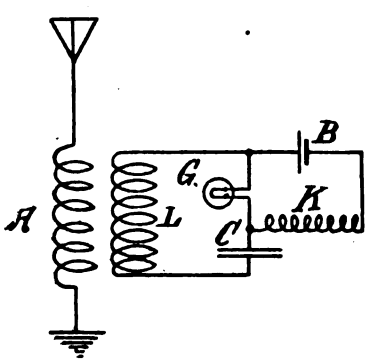
It is well known that, in a regenerative feed-back system employing a grid condenser having insufficient grid leak, the system oscillates intermittently, as indicated by a howling in the telephone receivers. That is to say, upon some slight unbalancing of the system, the tube is set to oscillating, the oscillations increasing in amplitude. When the amplitude of the oscillations stops increasing, the oscillations become unstable since any slight decrease in their amplitude fails to produce a corresponding decrease in the charge in the grid condenser; hence the oscillations continue to decrease in amplitude and finally stop. When the charge on the grid condenser has decreased to a sufficiently low value, as determined by the constants of the system, the oscillations again build up, as before, and the blocking action is repeated. It will be noted that the oscillations must build up to approximately the maximum limits of the tube before the blocking action becomes effective.

I have found that, by increasing the charge on the grid to values higher than the peak value of the alternating grid potential, in accordance with the varying intensity of a signal impulse to be detected, the blocking action may be manifested before the oscillations reach their maximum value, as determined by the constants of the tube, and that the maximum amplitude of the intermittent oscillations obtaining in the system is directly dependent upon the varying intensity of said signal impulse.

Detecting Small Electric Currents

No. 1,455,458: Patented May 15, 1923. Patentee: J. S. E. Townsend, Oxford, England.

The object of this invention is primarily to provide a simplified instrument whereby the wave length of electrical oscillations can be readily measured. The instrument may, however, be used merely



Means of measuring wave length by sight.

for detecting the presence of small oscillating currents.

It has been before proposed to employ an incandescent electric lamp bulb for detecting electric currents, but hitherto it has been possible to use such a detector only when the current is fairly large, that is, large enough to heat the filament from its normal condition to the temperature at which it becomes incandescent.

According to this invention I employ an evacuated bulb having its filament connected in series with a choke coil and a battery of sufficient strength to heat the filament to a temperature slightly above or below the point of incandescence, so that the lamp is in a sensitive condition to show visually any small change of temperature due to the passage through the filament of a small current, and I superimpose the current to be detected upon the current flowing from the battery through the filament, so that the addition of this small current to the normal current may cause a change in the condition of the filament, which change is easily distinguished by the eye. Such a detector is especially suitable for showing alternating currents or currents of high frequency, and may be used either to detect the currents or to indicate when they attain a maximum value.

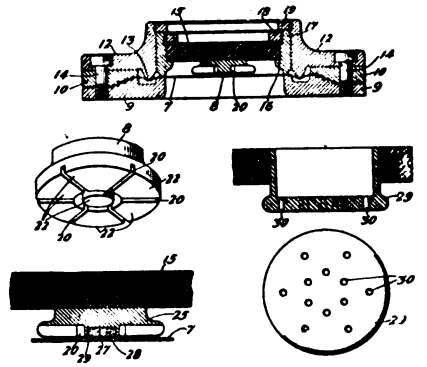
Acoustic Apparatus

No. 1,456,538: Patented May 29, 1923. Patentee: Irving B. Crandall, New York, N. Y.

THIS invention has reference to improvements in acoustic apparatus for the transmission, reproduction, recording, analyzing and measuring of sound waves. More particularly it relates to telephone transmitters, one of its objects being to produce a transmitter that gives practically a uniform transmission over a greater range.

It has been found that diaphragms such as are used in telephones, phonographs and other acoustic apparatus have a more or less marked natural period for one or more frequencies, and if acted upon by waves of these frequencies will respond more than for materially different periodicities. The natural frequency depends in general on the mass, and stiffness of the diaphragm, decreasing with increase in mass, but increasing with increase of stiffness.

In the usual telephone diaphragm the lowest natural frequency is in the neighborhood of 1,000 cycles per second, which is well within the range of those frequencies used in speech. Because of this natural periodicity and the resulting inequality in response to impulses of different frequencies a telephone diaphragm will distort speech



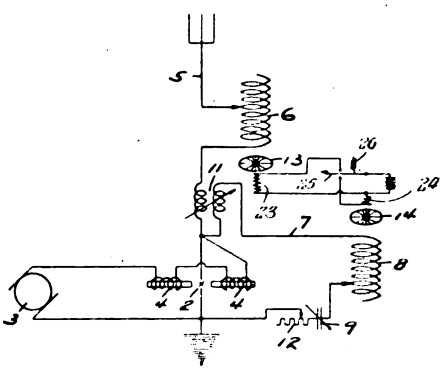
Improvement in diaphragm construction as applied to phones.

waves which are impressed on it when the resonance point of the diaphragm falls within that range which is of importance in speech. If, however, the elasticity or the stiffness of the transmitter is increased sufficiently this resonance point will be removed outside the speech range, and there will be a substantial equality of response to all impressed frequencies of the same intensity over a wide range of frequency. This maximum response at the resonance point could also be considerably decreased in value by increasing the damping factor of the vibrating system. The damping factor in general depends only upon the frictional forces and upon the inertia, being directly proportional to the frictional forces and inversely proportional to the inertia or mass of the moving system. Increasing the damping factor therefore gives a vibrating system a frequency characteristic of response more nearly of the ideal form.

Radio Telegraphy Signalling System

No. 1,454,629: Patented May 8, 1923. Patentee: H. F. Elliott, Palo Alto, Cal.

An object of this invention is to provide an efficient uniwave signalling sys-



Means of providing uniwave transmission.

tem for radio transmitting stations. The invention possesses other advantageous features.

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Answers to Readers of Radio World

I have been told that by using one tube and a crystal detector in a reflex circuit that I can get louder signals and longer distance than by the use of the detector and one stage of audio-frequency. Is this so? Why?—Carl Kinesta, Maryville, Ky.

You can obtain louder signals and longer distance with a reflex such as you mention. The reason is that with a one tube reflex circuit you are getting one stage of radio frequency amplification, and one of audio-frequency amplification, in connection with your crystal detector. With the other circuit you would only be using the tube as an audio-frequency amplifier, and here you are gaining the use of an added stage of radio-frequency.

* * *

Is it possible to guarantee a circuit to receive foreign broadcasting stations? I have received a circular from a radio manufacturer that states that he will positively guarantee his set to receive English broadcasters anywhere in the United States on two tubes and an outside antenna. Is this possible? A Constant Reader.—Kansas City, Mo.

It is a pretty difficult thing to guarantee the receiving range of any set, as there are many conditions that have to be considered, and we have never heard of a set that is guaranteed to receive over such distances. You had better investigate it thoroughly before purchasing. The statement "anywhere in the United States" is quite a large order, and while receivers have been made that will get English broadcasters along the eastern and central parts of the United States, it is not probable that a two tube set is capable of such work.

* * *

Which is the more efficient form of radio-frequency amplification, tuned impedance coupled, transformer coupled, or resistance coupled?—A. G. Grant, 1673 Broadway, N.Y.

As far as efficiency is concerned, the tuned impedance coupled is the best. This is because of the fact that transformer coupled and resistance coupled are only capable of receiving on a very narrow band of wave length, and on all others it will receive with decreased efficiency. By using tuned coupling, you are enabled to control the wave length of your amplifiers and therefore get the best response from your tubes.

* * *

Kindly explain how I could repair my tube. I broke the tip off, and the vacuum was lost.—Ezekial Henderson, Camp Kumwatchee, Indiana. General Delivery.

It is impossible for any one to repair tubes unless they are equipped with apparatus necessary, such as mercury pumps, and a full line of glass blowing equipment, as well as a most complete knowledge of lamp-glass blowing. It takes more than a knowledge of how it should be done.

* * *

Will you kindly publish a diagram of the Flewelling Circuit? What plate voltage should be used in this circuit? Will it operate a loud speaker? What tube should I use in this circuit?—Joseph E. Healy, 114 Cypress Ave., Bronx, N. Y. Alfred Neff, 23 Chatham St., San Francisco, California.

The Flewelling circuit was published in Radio World for March 24. From 45 to 60 volts is correct for the plate voltage. It is doubtful if there will be enough volume to operate a loud speaker on one tube; however, with one stage of audio-frequency you will be able to operate one. Would suggest that you use one of the U. V. tubes as you are looking for volume. This circuit will operate on dry cell tubes but the volume will be greater when the larger plate surface tubes are used.

* * *

Is there any advantage in winding coils and tuners with Litz wire? Are there any books published which will show me the different forms of winding coils? Where can they be obtained? Is my enclosed description of Litz wire correct?—George Stepanek, 3328 Portland Ave., Minneapolis, Minn.

The advantage gained in the use of Litz wire in the winding of coils is the lowered resistance and greater inductance. We advise you to get the book titled "Ideas for the Radio Experimenter's Laboratory," by M. B. Sleeper. It can be obtained from the Columbia Print Co., 1493 Broadway, New York City. It gives several ideas for the winding of coils and inductances that are of value to the radio enthusiast.

* * *

Where can I obtain a sketch or blue print of a set using five tubes using two stages of radio-frequency, detector and two of audio-frequency amplification?—John Budge, 65 McGregor Ave., Toronto, Ont., Canada.

A suitable circuit for this purpose was published in Radio World for June 30, in the "Answers to Readers" department.

* * *

In Radio World for March 24, you published a photograph of B. R. Mayo. Where can I obtain his address?—Mrs. C. B. Holden, Midland Park, N. J.

The address of B. R. Mayo is 2761 Broadway, New York City.

* * *

On page 16 of Radio World for June 2, you published an article by W. S. Thompson, on a simple reflex set. Where can I secure a diagram of this set in "long hand," as I am not familiar with technical diagrams? Can the set mentioned be used with the U. V. 199 tubes? Can a variocoupler or variometer be used with this set?—Carl E. Morrison, 545 62nd St., Brooklyn, N. Y.

From your description we understand that you cannot translate a diagram. Suggest that you take the diagram in question to some friend that is familiar with such things and have him help you, as the description that you ask for would take up too much space to allow us to print it. The set can be used with these tubes. Yes, it is possible to use this set with a variocoupler by connecting the secondary of the coupler in place of the loop, and using an antenna and ground.

* * *

I constructed the single circuit regenerative receiver that was described in Radio World for April 24, by Arthur S. Gordon. I have checked this circuit very carefully, but cannot get anything out of it. What is my trouble?—Reinhold Dalhm, R. R. 2, Box 44, Hartford, Wis.

Your diagram is correct, and we suggest that you examine the grid leak and condenser and make sure that all your connections are good. Soldering them is best. If you have hooked the set up exactly as your diagram shows there is no reason for the circuit not operating, as it is absolutely correct. Make sure of your B battery, and see that your antenna is not grounded.

* * *

Will you please publish the circuit diagram that is used by Myrle Wood, in your Nite Owl Records of Radio World for June 2? Can honeycomb coils be used in this circuit for long waves?—R. Babylon, 3024 Fern St., New Orleans, La.

The circuit diagram as used by Myrle Wood was published in the issue you mention. You cannot use honeycomb coils in connection with this circuit. You can load it up by the use of the coils you mention; but the fact that it uses variometers will naturally limit the range of such practice.

* * *

Which is more efficient as to distance work, a three tube reflex or a single circuit receiver with two steps of amplification? Is the circuit used in the De Forest D7 a reflex circuit? Is regeneration necessary in order to receive telephone signals? Is a crystal set capable of regeneration?—William Morris, 345 West 54th St. New York City.

The more efficient of the two sets mentioned is the reflex if properly constructed and tuned. This is because of the fact that radio-frequency amplification is used, which allows amplification of the signals before rectification. With a single circuit set, with audio-frequency amplification, no signals can be amplified that are not heard in the detector alone. The De Forest D7 is a reflex circuit. Regeneration is not necessary in order to receive signals. A crystal set is not capable of regeneration.

* * *

Can I use the —— coupler in a reflex receiver, using a crystal detector? Where may blue prints of reflex sets, with panel layouts and all necessary data be furnished? —James R. Kaker, Str. "Malutoa," Sault Ste. Marie, Mich.

The coupler you mention can be used in connection with the reflex circuits. We do not handle blue prints of circuits. Apply to S. Newman & Co., 74 Dey Street, New York City.

* * *

Where can I obtain instructions as to the exact tuning in of long distance stations using the set described in Radio World for May 12, by C. H. Stoup?—J. H. Parkhurst, 221 S. Ashland Blvd., Chicago, Ill.

Information as to the exact tuning of any particular set is very difficult to give, as it is only by familiarity with your own set that you can learn how to tune any set, even a crystal set. In order to properly tune any set you must practice and get used to it.

* * *

Is there any practical method of eliminating static?—Joe Kavanaugh, 519 Grant Ave., Hoboken, N. J.

Static cannot be entirely eliminated, but it can be diminished by the use of a loop antenna. If an outside antenna is used no series condensers should be used in the antenna-ground circuit, and the use of a short, low antenna will help. See article on static by Kenneth Malcolm in Radio World, June 2.

* * *

Will you publish a diagram for two stages of radio-frequency detector and two stages of audio-frequency in a set? Will it enable me to receive from 200 to 600 meters? Will it work on a loop?—Walter Mack, 806 No. Windomere, Dallas, Texas.

A diagram such as you wish was published in Radio World for June 30 in answer to a question by A. Hallam. It will enable you to receive over the wave band you desire. It is possible to work the set on a loop.

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What the Public Likes in Broadcasting Programs Partly Shown by Letters

AT the close of radio programs announcers invariably ask the audience to express its appreciation or criticism in writing. "We want to broadcast programs which you like, and unless you write we will not know what you enjoy," they say.

Dr. Burton, of the University of Michigan, in a baccalaureate sermon, said: "The first requisite of valuable public service is not the desire to find out what most of the people want, but the purpose to help people want what they ought to have."

The big question in the program director's mind is whether to give the public what it wants or learn what it should have and broadcast that, says a writer in the New York *Times*. A radio impresario entertains the largest audience of any showman, and he can lose his audience in a second. Few people walk out of a theatre, circus or concert if the program is not what they desire, but a slight turn of a radio dial and any member of the audience can free himself from the theatre of the air without disturbing the others. The station which radiates a program that the people "ought to have" is generally a victim of tuning out as the dials revolve to bring in some other station broadcasting what the listeners want.

Based on the quality and merits of music, opera and classical selections are what the music masters say the public "ought to have." Letters received at the radiophone studios show that great differences exist between that estimate and what the radio audience wants.

What does the public enjoy most? This question is answered in part by the letters. However, these represent but a small percentage of the audience. Comparatively few express their applause or criticism in writing.

Believing the Volstead Act to be something many people do not want, and others think the nation ought to have, the impresario of WEAF selected as part of an evening program a prohibition debate between prominent wet and dry leaders. Considerable interest was aroused, as indicated by telephone calls which overburdened the wires with questions from radio listeners. About 2,000 letters were received from the estimated thousands who tuned in on the debate.

To determine how many listened to the prohibition arguments and other features broadcast from the station a survey was conducted through the co-operation of sixty newspapers. The general plan was to obtain a fairly accurate figure relative to the number of receiving sets tapping the ether within a 100-mile radius of WEAF's aerial. The census showed about 13,600,000 persons living within that radius, and the results of the survey indicated about 600,000 receiving sets.

A study made by the Radio Corporation of America pointed to a division of the radio audience into two general classes—one which wants jazz and the other classical music. New stations are generally provided with two studios so that a classical concert and dance music can be broadcast simultaneously.

Telephone calls and letters addressed to the program directors indicate clearly that jazz bands are the favorite of youth. A symphony orchestra and opera bring correspondence expressing appreciation and is apparently the most pleasing form of musical entertainment to many of the older listeners. The trend seems to indicate that the radio audience is growing more critical in its tastes. It is admitted that light music is appreciated by many, but several program directors believe jazz is merely a diversion to be heard at intervals rather than regularly.

There is a great gap between the listener who wants dance music and the one who favors high-class selections. The middle group of listeners seldom take time to write to a radio station.

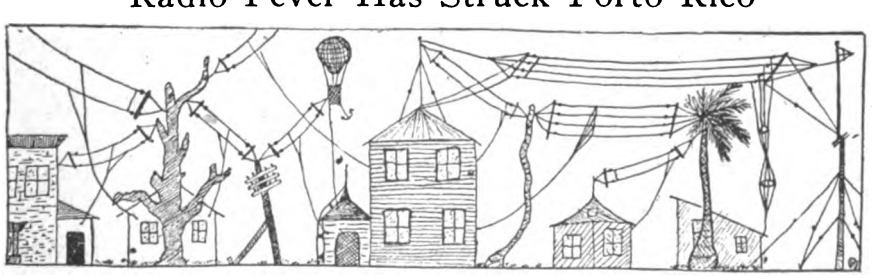
Large sales have been recorded in the radio business on advance notice that a prize fight would be sent into the air, blow for blow, direct from the ringside. Football games and the World's Series baseball contests stimulated the sale of radio instruments to a marked degree. A conquest for supremacy is a radio event which entertains the mass of those listening in. People the world over throughout history have found pleasure in conquest, so this favorite program of the radio theatre is little different from the programs in the coliseum of ancient Rome, the lists of England and the arenas of Spain.

Just before a contest is broadcast many people invest in a radio receiving set to hear the contest direct, first hand, the instant it happens, whether the result be a knockout, a touchdown or a home run. Music has its charms, but a fight for supremacy and championship fascinates and quickens the pulse even by radio.

During the last few months WEAF has broadcast a program at 11 a. m. daily. Many wondered if such broadcasting would be worth the time and expense because few persons would be listening at such an hour. Correspondence shows that the morning program entertains a new audience—women at home and people who work at night. Correspondence from women has more than doubled, and many of those who work at night write to tell how the 11 o'clock entertainment affords the only opportunity they have to tune in. It is estimated that about 7 per cent of the population of New York works at night, so the 11 o'clock audience is not a small gathering.

Musical comedy selections are popular, as they travel through the air especially to listeners in outlying districts. The effect of broadcasting one act of the musical comedy "Wildflower" through the microphone was called a revelation. For several weeks afterward every performance was sold out, and the largest advance sale ever reported for the Casino Theatre was recorded. Radio evidently gave sufficient suggestion of the quality of the performance to attract hundreds to the box office.

Radio Fever Has Struck Porto Rico



From Porto Rico Radio News

MAGNAVOX
Radio Products

R3 Magnavox Radio The Reproducer Supreme

Make Your Receiving Set Complete

The efficiency of the Magnavox Reproducer is due to its principle of construction.

Only the Magnavox (electro-dynamic) reproducer can re-create broadcasted programs according to their original *pitch, quality* and *volume.*

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . $90.00

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field $60.00

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . $35.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

Magnavox Radio products can be had of good dealers everywhere. Write for copy of our new booklet.

The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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THE RADIO BUSINESS IS GETTING INTO FINE SHAPE. AS FORBES SAYS: "THE BEST STEEL IS THAT WHICH HAS UNDERGONE THE HARDEST POUNDING."

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

W. Stark, Box 154, Portland, Texas.
Kent Deckard, P. O. Box 3, Rusk, Texas.
Frank E. Boyd, Woodland Street, Englewood, N. J.
D. W. McArthur, Jr., Box 74, Montbrook, Fla.
Theodore F. Hehlandt, 917 Watson Street, Ripon, Wis.
W. M. Sudmore, 2206 Elinor Drive, Des Moines, Iowa.
E. H. Harvey, 4008 Westminster, St. Louis, Mo.
G. W. Fitzmaurice, Big Oak Flat, Calif.
Robt. G. Vaughn, Jr., 357 Church Street, Greensboro, N. C.
P. H. Duncan, 1250 Starr Avenue, Burlington, Iowa.
H. O. Mendousa, 241 North Euclid Street, Pasadena, Calif. (Wants to buy receiving set.)
A. H. Cumming, Lewellen, Nebr. (Dealer.)
E. H. Haysel, 4258 Normal Avenue, Los Angeles, Calif. (Will soon establish exclusive retail radio business.)
Will Wiggins, Warkworth, Ontario, Canada. (Dealer.)
Ernest Pumphrey, 2410 Olive Street, Texarkana, Texas.
C. R. Cochran, P. O. Box 434, Cottage Grove, Oregon.
G. Pericaud, 85 Boulevard Voltaire, Paris XI, France.
Taylor Radio Shop, Minonk, Ill.
K. G. Howard, Alsen, Greene Co., N. Y.
H. V. Lounsbury, 530 King st., Stratford, Conn.
C. H. de La Monti, 252 West 64th St., New York City. (Builds to order highest type sets.)
C. Kendle, 217 Klotter Ave., Cincinnati, Ohio. (Wants tube repairing outfit.)
G. L. Michard, 1346 Geddes Ave., Ann Arbor, Michigan.
Swain Solon, Shenandoah, Iowa. (Wants parts.)
Lloyd J. Lewis, R. I. Box 68A, Baraboo, Wis. (Wants loud speaker.)
H. Elgie, Woodfibre, Howe Sound, British Columbia, Canada. (Handles parts as side line.)
C. A. Rheinstrom, 235 West 108th St., New York City.
Thos. Ellingson, 4136 North Kildare Ave., Chicago, Ill.
C. H. Chisholm, 16 Ashland St., Malden, Mass.
Joe Boyd, Box 167, Wynona, Okla. (Dealer.)
C. A. Marshall, 46 Newton St., Ottawa, Canada.

Crosley Holds Jobbers' Convention

THE Crosley Manufacturing Company held a jobbers' convention at its home offices in Cincinnati, Ohio, on July 10 and 11. There were present representatives of the largest jobbing houses of the country to inspect the Crosley company radio plant, wood-working shop, printing office and broadcasting station, WLW. Numerous valuable suggestions for the marketing of radio products were advanced during the sessions of the meeting, most of them in correction of past mistakes in the industry as a whole.

De Forest Elects New Officers

AT a recent meeting of the board of directors of the De Forest Telephone & Telegraph Company, Jersey City, N. J., the following officers were elected: E. H. Jewett, president; Chas. Gilbert, vice-president and treasurer; and R. M. Keator, secretary.

$1,000,000,000 Gain in 1923 Crop Value Considered Big Thing for Radio

Radio manufacturers, distributors and dealers should go right out for the farmer trade.

A government forecast shows that the crop value in this country for 1923 will show a gain, at the present market prices, of $1,000,000,000 (one billion dollars) over the crop value of 1922.

The farmers are going to have money.

They can afford to buy radio sets.

Sell 'em!

Dr. Gildersleeve's Set Goes to the Veterans—Six Tubes Needed

FOLLOWING the suggestion of RADIO WORLD, made in last week's issue, Dr. Donald M. Gildersleeve, 169 Prospect Park West, Brooklyn, N. Y., generously has donated a six-tube receiving set to the Veterans' Mountain Camp, Big Tupper Lake, N. Y. The set goes forward this week to the officials in charge of the camp.

The set is a Rico JM-6 and is complete with the exception of the necessary six tubes. Now, will one or more readers of RADIO WORLD come forward with the tubes? Their prompt generosity will complete Dr. Gildersleeve's fine gift. De Forest, Radiotron, or Cunningham tubes may be used.

Gentlemen, the veterans can't listen in without tubes for their new set!

That Stencil List of Radio Manufacturers and Dealers

A trade reader of the Merchandising Department of RADIO WORLD has asked for information as to the number of names of radio manufacturers, jobbers and dealers obtainable from concerns having stenciled lists. Inquiry has been made of one of the most important list dealers in this country, and we are informed that a corrected, up-to-date and authoritative list of the names wanted would show the following figures:

Radio manufacturers	1,826
Radio jobbers	1,758
Strictly radio retailers	3,867
	7,451

And that seems to be the answer.

Western Electric Does Big Business

FIGURES of the Western Electric Company show that its billed goods were valued at $114,890,000 in the first half of 1923, an increase of $15,237,000, compared with the same period last year. Orders booked in the first half of this year approximated $142,805,000, which is $57,363,000 more than last year.

Orders Show Big Increase

THE Westinghouse Electric and Manufacturing Company reports new orders valued at $47,500,000 in the second quarter of 1923, against $32,119,000 in the same period last year.

New Radio and Electric Firms

Electrial Thermal Machinery Co., manufacturing apparatus for electrical heat treatment of metals and alloys, $1,000,000; Edwin S. Pickett, Jos. E. Perry, New Haven, Conn.; Daniel J. Keefe, West Haven, Conn. (Corporation Service Co.)

Volton Battery Co., New York City, has increased its capital stock from $5,000 to $20,000.

The Improved Electric Products Co., Cleveland, Ohio; capital, $10,000; manufacture and deal in electrical devices; incorporators, H. D. Weinstein, Wayne C. Black, M. Becker, G. H. Brunswick and W. G. O'Haren.

McPhilpin Radio Electric Corporation, Brooklyn, N. Y., has increased its capital stock from $20,000 to $30,000.

Barclay Electric Co., New York City, has increased its capital stock from $20,000 to $25,000.

Brackman Electric Co., Rochester, N. Y., $50,000; A. L. and C. Brackman, R. J. Jauss. (Attorney, W. V. Armstrong, Rochester.)

Harlem Radio, New York City, $5,000; H. C. Bernheim, M. Lovett. (Attorney, M. L. Gilman, 27 Cedar Street.)

Mu-tron Radio Corp., install radios, $250,000; George A. Blackford, Wheeling, W. Va.; A. Tegarden, Martin's Ferry, Ohio; T. M. Darrah, Wheeling, W. Va. (Attorney, Horace G. Eastburn, Wilmington, Del.)

Status of American Telephone & Telegraph Co.

THE American Telephone and Telegraph Company, parent company of the "Bell System," had net working capital of $113,214,961, according to its balance sheet as of March 31 last, current assets standing at $138,334,102 and current liabilities at $25,119,141. On December 31, 1922, net working capital amounted to $99,695,528. Its report to the Interstate Commerce Commission shows net operating income of $13,427,554 for the first five months of the current year against $11,228,459 in the corresponding period of 1922. Operating income for May was $2,643,284 against $2,437,947. Net earnings of seventy telephone companies for the four months ended April 30 last totaled $48,225,509, an increase of $7,736,354 over the first four months of 1922. Operating revenue was $210,723,542, an increase of $22,041,534.

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Daily Newspapers Publishing Radio News and Programs

AS a part of its service to readers RADIO WORLD publishes herewith the names of daily newspapers which carry radio programs and radio news. Wherever possible the name of the radio editor of the paper is given. Additions to the list will be published as received.

The Lawrence Daily Eagle (morning), The Evening Tribune, Lawrence, Mass. Howard G. Lewis, radio editor, care The Eagle. Both publish daily radio programs and a radio column.

Daily Evening Item, Lynn, Mass. Clayton L. Carpenter, radio editor. Prints daily radio program.

The Evening Sentinel, Ansonia, Conn. Prints daily radio programs of nearby stations.

The New Haven Register, New Haven, Conn. Publishes same radio programs as The New York Tribune. H. I. Jenks, radio editor.

Worcester Evening Post, Worcester, Mass. Publishes daily radio programs from stations broadcasting in New England, North and Middle Atlantic States. Address communications to Radio Editor.

The Standard, New Bedford, Mass. Evening and Sunday. Carries daily radio programs and a full page of radio news on Sunday. Lester I. Jenkins, radio editor.

The New Bedford Times, New Bedford, Mass. Evening and Sunday. Daily radio programs. Full page of radio news on Sunday. Leonard Finnell, radio editor.

Boston American, Boston, Mass. Publishes daily nearly complete programs of six or seven stations and a schedule of evening and night broadcasting hours of 30 to 40 other stations.

Des Moines Sunday Register, Des Moines, Iowa. Publishes a summary of leading station programs for the ensuing week. James D. Le Cron, radio director.

Pine Bluff Commercial, Pine Bluff, Arkansas. Evening. Radio column discontinued during summer. Probably resume daily programs and radio news about October 1. James E. Miles, Jr., radio editor.

The Springfield Republican, Springfield, Mass. Daily, Sunday, weekly. Publishes radio programs daily and Sunday. Arthur F. Hardwick, radio editor.

The Hartford Courant, Hartford, Conn. Conducts regular radio departments. Publishes daily detailed programs of prominent broadcasters. Also operates its own broadcasting station, WDAK, and presents a weekly program every Saturday night. John R. Donahue, radio editor.

(To be continued)

In the Market for Many Items

EDITOR, RADIO WORLD: We are just building our models and patterns of radio apparatus, and we need much material, but have difficulty in finding the right parties who manufacture and sell same at lowest prices. To house our apparatus we want manufactured for us "wood fibre cabinets" of similar materials to that in fibre water buckets, and finished in ebony, walnut, etc., at a low price to cut out high priced cabinets. We also need wood rotors, rotor axles or shafts, cardboard and fibre tubes, aerial wire, magnet wire, insulated lead in and ground wire, insulators, binding posts, dials, contact point, switches, switch stops, crystal detectors, headphones, washers, nuts, machine screws, brass rods, round and square, condensers, transformers, tubes, etc., etc.. We must buy them as low as possible to reduce the present high prices on radio apparatus and will sell direct to users only.

Yours truly,
ADAM SCHICK.

Vinland, Kansas.

Radio Certainly Boosted These Songs and Music

EDITOR, RADIO WORLD: In regard to Broadcaster-Music Publisher fight I can truthfully say if it were not for the broadcaster I would not have heard and bought every new song or musical piece that I have at present. I have bought as high as seven pieces per week and also the same with records.

Every opera that was broadcast by WJZ when the station was in Newark was attended by at least three of my family or friends who had listened with me.

Yours very truly,
R. W. FINTER, SR.

126 Wainwright St., Newark, N. J.

Radio Parts Wanted by This Buyer

EDITOR, RADIO WORLD: I will purchase about $1,500 stock of standard radio parts before September 1 and would like to get in touch with manufacturers making good quality items, including fixed and variable condensers, vario-couplers, variometers, H. C. coils, storage and dry batteries, cabinets, etc. I will be located at San Antonio, Texas, and would appreciate your service.

Very truly,
GEO. L. EDWARDS.

Gibson, Mo.

Robin Radio Shop Opens New Quarters

AFTER a successful year at Craig Street and Centre Avenue, Pittsburgh, the Robin Radio Shop has been obliged to move to larger quarters at 3602 Fifth Avenue, Pittsburgh.

Right Side of Store More Valuable

IF your store has only one entrance the right side is the more valuable, says Harry Botsford in Electrical Merchandising. He continues:

An electrical merchandise dealer in Harrisburg, Pennsylvania, brought the matter to my attention. I consider him as one of the very best retailers I have ever known.

"The right hand side of my store is easily worth four times the other side," he told me a month ago. "This is a fact and not a mere theory. I've been in business for over ten years and I'm considered a fair business man, yet several months ago I discovered that something has been happening in this store every day, and I have never noticed it. And what I discovered has a direct bearing on sales, too!

"As you know, I am strong for service to customers. Originally, I had one telephone pay-station in the rear of the store. I managed to convince the telephone company it would be good business to install two telephones there. Each telephone was placed on a small table, fitted with a chair, at opposite sides of the store. Each was equally convenient and there was no reason in the world why one should be used more than the other. Yet at the end of the first month, the telephone on the right had taken in just four times the number of nickels the other had. I gave the matter scant consideration. The next month the same thing happened. That gave me the theory on which I subsequently worked.

"I decided on several experiments to prove whether or not people naturally had a habit of turning to the right when they enter a store. I had had for two weeks a very good-looking display of hair-driers and curling-irons in my front-center showcase. The sales on these items were very low for that period—only three had been sold, to be exact. I moved the display over to the right hand side of the store. The very first day it was there we sold more than we had sold before in two weeks.

"That almost convinced me; but I made other experiments. A display of electric flashlights and renewal batteries which had been selling very well on the right side of the store were moved to an equally well-lighted showcase on the left side of the store, and the sales dropped just an even 95 per cent. I have tried plan after plan of shifting and the net of my results is that I sell about four times the goods on the right as I do on the left."

Radio Trade Notes

The plant of the Virginia Radio Corporation at Charlottesville, Va., recently was damaged by a $10,000 fire. The loss was fully covered by insurance.

* * *

Ashton Bremner, 1 Margaret St., Oxford Circus, London, W. E., England, is open to represent American firms interested in the British market.

* * *

Rocky Mountain Radio Corporation, 1512 Broadway, Denver, Colo., is in the market for cheap crystal detectors, knocked down.

* * *

Arthur Unger, formerly assistant manager of the Permanent Radio Fair, New York City, has become a radio manufacturers' representative, with offices at 30 East 23d Street, New York City.

The C. D. Tuska Company's Main Assembly Room

Here are assembled the radio products bearing the well known trade-mark of the C. D. Tuska Company, Hartford, Conn.

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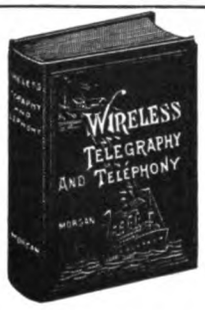
IF YOU ARE INTERESTED IN RADIO YOU NEED THESE BOOKS

Radio Books for Your Vacation

Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems



Wireless Telegraphy and Telephony Simply Explained

By ALFRED P. MORGAN

One of the most complete and comprehensive treatises on the subject ever published. A study of its pages will enable one to master all the details of the wireless transmission of messages. The author explains in simple language the theory and practice of wireless telegraphy and telephony. 154 pages, 156 engravings.....PRICE $1.50

The A B C of Vacuum Tubes Used in Radio Reception

By E. H. LEWIS

Assoc. I. R. E., and Radio Instructor

Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated.....PRICE $1.00

Experimental Wireless Stations

By P. E. EDELMAN

Tells how to make apparatus to not only hear all telephoned and telegraphed radio messages, but also how to make simple equipment that works for transmission over reasonable long distances. Then there is a host of new information included. The first and only book to give you all the recent important radio improvements, some of which have never before been published. 392 pages, 167 illustrations....PRICE $3.00

☞ The 3 Books for $5.00 to One or Different Addresses
Any of These Books Sent Prepaid on Receipt of Price

ADDRESS **THE COLUMBIA PRINT**

ROOM 326, NO. 1493 BROADWAY, NEW YORK

Sleeper's Two Latest Radio Books

Two new and remarkably good radio books by M. B. Sleeper —one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a generative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for $1.00 and no extra charge for postage. The Columbia Print. 1493 Broadway, New York City.

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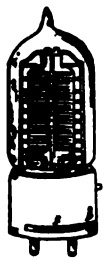

Send us your Burnt-out Tubes

We Repair

U. V. 200.....	$2.75
U. V. 201.....	2.75
C. 300.....	2.75
C. 301.....	2.75
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Have you that range of selectivity? With a COAST COUPLER as part of your equipment it is easy. Why don't you try it? By sending $5.00 you will receive postpaid a COAST COUPLER and one of our famous hook ups which we guarantee will do all that is claimed for it.

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This binder is securely made, is attractive in appearance, and each copy can be added weekly without any difficulty.

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65 cents each

(*Sent parcel post prepaid.*)

Address Sub. Department

RADIO WORLD

1493 BROADWAY NEW YORK

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
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SUBSCRIPTION RATES

Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.
Add $1.00 a year extra for foreign postage. Canada 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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Entered as second-class matter, March 28, 1923, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

New Type Radio Control for Airplanes

A NEW type of automatically directed airplane performed marvellously before Marshal Petain and other high army officers at the Villa Coublay aerodrome near Paris recently, according to a press dispatch.

The control device consists of a roll of perforated paper as that of a player-piano roll. The movement is directed by wireless from the ground. As the roll moves it sets in action mechanical arms and legs which direct the plane, control the motor and release bombs.

The new craft marks great progress over other automatically controlled aircraft because there is less electrical apparatus on the airplane.

Oakland Broadcasters Increase in Number

THE Oakland *Tribune* in California is planning to increase the power of its broadcasting station, and hopes by October to be in a position to apply for a Class B license. At present KLX is operating as a Class C station on 360 meters with a power of 250 watts. New apparatus for a 500-watt set has been ordered from the Western Electric Company, and, with a 300-foot antenna, a far wider broadcasting range is planned this fall.

There are seven broadcasters in Oakland and its vicinity, two B stations and four A stations being in San Francisco, across the bay. The new General Electric station

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The Most Interesting Boys' Book

Unlike so many other books of a somewhat similar nature, it is not confined to only one or a few subjects, but describes 700 different things boys can make and do in the fields of mechanics, electricity, sports, arts and crafts work, magic, etc.

An unusually generous book; size 7 by 10 in. and 1½ in. thick; printed from large, clear type on high grade book paper and durably bound in cloth. Attractive four-color cover design.

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Besides telling how to make scores of things useful about the house, full and complete directions are given for constructing hundreds of things which appeal to the heart of every boy.

Many hours of enjoyment are in store for the boy who becomes possessor of this book.
Price $2.00 Prepaid to Any Address

THE COLUMBIA PRINT
1493 Broadway New York City

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Radio Locates Line Trouble

WHEN the two St. Croix transmission lines of the Northern States Power Company tripped out at 1:55 P. M. on January 30, both telephone lines to St. Croix were put out of commission, according to the Electrical World. F. J. Gerlich, superintendent of the service department, lost no time in getting to the radio set, and upon tuning in immediately heard the wireless operator at St. Croix calling Minneapolis. By means of radio-telephone communication the trouble on the transmission lines was quickly cleared up, and both lines were back in service by 2:05 P. M. (within ten minutes). Wire telephone communication was not re-established until half an hour later.

Don't ask for Rheostat—Say

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FOR REAL FILAMENT CONTROL

Trailing Fake Battery Sellers

WITH purpose to curb and, if required, to aid in the prosecution of deceptive advertising in the storage battery field, the national vigilance committee of the Associated Advertising Clubs of the World and its affiliated better-business bureaus and commissions have launched a campaign against unscrupulous manufacturers and dealers. The vigilance committee contends that some service stations known and advertised as the authorized representatives of well-known manufacturers are prone to trade upon the established good name of reputable concerns through the substitution of foreign or inferior parts in the reconstruction of batteries.

Summer Schedule of WIP

GIMBEL BROTHERS, Philadelphia, who operate Station WIP, inform RADIO WORLD that they will not broadcast any program on Saturdays or Sundays during July and August. The regular seven-day-a-week schedule will be resumed on September 1.

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it. Buy your "B" Batteries direct from Manufacturer. No old stock batteries, but fresh tested batteries, with a 100 per cent. efficiency, at the following low prices, which are 50% less than list price.

	Large	Medium	Small
22½ Volt plain	$1.25	$1.00	$0.70
22½ Volt variable	$1.38	$1.13	$0.75
45 Volt plain	$2.50	$1.75	—
45 Volt variable	$2.75	$2.00	—

Any other type of battery made to order. Send Money Order or Order for C.O.D.

ROSENDAL & CO., 2 Stone Street, New York

WOULD YOU LIKE TO RECEIVE RADIO ADVERTISING MATTER?

Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want.

ADDRESS SERVICE EDITOR, RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

¶ "Radio," the San Francisco magazine, is a very excellent publication. We have made arrangements with the publishers by which we are able to offer for a limited time only a six months' subscription for RADIO WORLD at the regular price of $3.00 and also "Radio" for six months without extra cost.

¶ Send your $3.00 at once, as this offer is open only until July 30, 1923.

CUT OUT AND MAIL TODAY

Special Radio World and "Radio" Subscription Blank

RADIO WORLD, 1493 Broadway, New York City.

Enclosed herewith find $3.00 for which please send RADIO WORLD for six months beginning with issue of ..... and "Radio" for six months, beginning with issue of ..... There is to be no other charge to me.

You may, if you wish, send remittance for $6.00 and receive RADIO WORLD for one year (52 issues) and "Radio" for one year without extra cost. This offer good only until July 30, 1923.

Name .....

Street Address .....

City and State.....

Government Wants Radio Engineers

THE United States Civil Service Commission announces the following open competitive examinations: Radio Engineer, $4,000 to $5,000 a year; Associate Radio Engineer, $3,000 to $4,000 a year; Assistant Radio Engineer, $2,000 to $3,000 a year.

Applications will be rated as received until October 30. The examinations are to fill vacancies in the positions named, or in positions requiring similar qualifications. in the federal classified service throughout the United States.

The duties are to conduct or superintend the development, design, construction, installation, standardization, and the writing of specifications for practical and special apparatus and methods of radio communication, such apparatus to include sets for land use for more or less permanent stations, also for portable land stations, and for airplane and ship sets, and similar lines.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects: Education and preliminary experience, 30%; special experience and fitness, 40%; publications, reports, or thesis, to be filed with application, 30%.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the Secretary of the Board of U. S. Civil Service Examiners at the post office or custom house in any city.

Forthcoming Features of Program at WGY

THE Georgia Minstrel Boys, one of the most popular of recent attractions at WGY, the Schenectady broadcasting station of the General Electric Company, will give another program July 27. Within twenty-four hours of their last program 1,400 letters were received by the station.

Monday evening, July 23, Edna Schuyler, pianist; Mrs. Fred Harris, contralto, and Rosina Holmes, reader, will appear. The program on Tuesday night will be presented by the Gibson Mandolin Club, Joseph Carroll, tenor; Edith MacCulley Corlette, reader, and Ethel Mincoff, pianist. The mandolin club will play the type of selections that sound good on the water—the kind you like to hear as you drift along in a canoe.

"The Royal Mounted," a four-act play by DeMille, will be presented Thursday night, July 26, by the WGY Student Players, assisted by three members of the WGY Players.

A classical program is scheduled for the late or 10.30 p. m. program Friday. The artists will be Raymond Sachse, piano; Lloyd Beebe, cornetist; Raymond Stine, reader, and Leo Kliwen, violin.

Sunday, July 22, the morning service of the First Reformed Church of Schenectady will be broadcast, and in the evening a studio religious service will be broadcast, with a sermon by the Rev. Robert W. Anthony.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEER, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

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WYG Gets 65,000 Letters from Fans

SINCE the inauguration of broadcasting by WGY, sixteen months ago, the General Electric Company has received 65,000 letters from listeners scattered over the United States and from points as widely apart as Hilo, Hawaii, and London, England; Vancouver, Canada, and Valparaiso, Chile.

Some of these letters are typewritten and from the offices of business and professional men and some are penciled on scraps of paper from woodsmen and from forest rangers. All the letters acknowledge appreciation of the broadcasting service the General Electric Company is giving and, by the very fact that they are written, prove that the writer feels that the company addressed has a heart, is interested in the letters and receives them sympathetically and appreciatively.

Until WGY began broadcasting, the mail of the General Electric Company was made up of the usual type of business and technical letters. Broadcasting began a veritable flood of warm, personal missives in many of which intimate facts relating to the family were unbosomed. The listener feels that the voice coming out of the air is that of a friend. It enters his home and provides pleasure and entertainment for all the members of the family circle and in acknowledging appreciation the writer addresses the station as a friend.

An elderly woman wrote WGY in part as follows:

"Accept my thanks for the two sermons yesterday. I am a poor, hopeless invalid and they were most comforting. I shall be waiting for the coming Sabbath for you have brought something into my life I had never expected to enjoy again."

Another, also an invalid, wrote: "I have been an invalid for over twelve years, confined to my wheelchair or couch nearly all that time and it is indeed a great privilege to hear the dear old hymns which I love so well and the word of God so faithfully proclaimed. It helps me forget my suffering for I am a great sufferer. * * * It is little I can do to help carry the burdens of the world but at least I can keep sweet and WGY helps me do it."

A mother told how each of her children enjoy the WGY concerts, even an eighteen months' old infant, she said, was comforted when the phones were placed over its head. A blind girl related how she had grown melancholy and depressed and then radio came along and she now has a daily joy to anticipate.

WGY requested letters from listeners when the station was started because those in charge of the technical operation wanted to know the quality of the transmission and the range of the station. When these facts became known the announcers continued to ask for letters because these letters constitute the only applause which the radio performer gets, and a large number of complimentary letters is an inspiration. So far as the performer in the radio station is concerned he has only the word of the engineers that his solo is being radiated many miles. When the letters come he knows that the words sung in the radio station in the presence of only his accompanist and an announcer, have taken flight over many states and brought pleasure to countless homes.

These letters are also useful to the program manager for from them he learns what type of program appeals to the majority of listeners and the letters strongly influence his decisions in building up future programs.

After a recent minstrel show broadcast by WGY 1,400 letters were received by

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Radio World has made arrangements
—by which it is possible
—to offer a year's subscription for
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This is the way to get two publications
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—Send $6.00 today for Radio World
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—and select any one of the other
—four publications for twelve months—
—This offer good only up to and
—including August 10, 1923.
—Present Radio World subscribers
—can take advantage of this offer by
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—Or order thru your newsdealer.

RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK

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Enclosed find $6.00, for which send me RADIO WORLD for twelve months (52 numbers) and also, without additional cost, Radio News or Popular Radio, or Wireless Age or Radio for twelve months.

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This Offer Good Until Only August 10, 1923

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RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway N. Y. C. (Phone, Bryant 4796).

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FORMS to cast Tin Soldiers, Marines, Indians, Trappers, Hunters, and my Air Pressure Cannon Machine. Moulds from $1.25 up to $3.50, casting 3 to 4 pieces at once. Write for catalogue. Ht. Schiercke, 1304 72nd St., Brooklyn, N. Y.

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CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

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OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

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HONEY COMB COILS—35, 50 or 75 Turn, 40c, Each Mounted, $1.25; Special Windings to Order. Tapped Honey Combs, 3c per Tap. Crystals—Honest John's Old Fashioned Crystals. "Thunder Note" (Pyrites) and "Wonder Rock" (Galena). Tested, guaranteed and individually boxed. Each Crystal as big as a walnut. Biggest value in radio, 25c each. Small Pyrites or Galena Crystals for mounting, 75c per pound. Dealers and jobbers, write for special quotations. Factory agents wanted in some States. HONEST JOHN MFG. CO. (Dept. RW.), 1509 East 11th Street North, Portland, Ore.

AMRAD NO. 2500 BROADCAST TUNER, ONE-STEP RADIO, DETECTOR, TWO AUDIO—List, $125.00; sell, $80.00. Also complete specified parts Mawhinney circuit, includes panels, $50.00. Both sets never used. Struller, 6 Fuller Place, Brooklyn, N. Y.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

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Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

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TWO FOR THE PRICE OF ONE—Send $3.00 now for six months' subscription (26 numbers) for Radio World during the coming month and we will send you also Popular Radio or Wireless Age or Radio for six months without any extra charge. Or send $6.00 now and we will send you Radio World for one year (52 numbers) and Popular Radio, or Wireless Age or Radio for one year. These offers not good after July 23, 1923. If you are already a subscriber you can take advantage of this offer by renewing from the end of your present subscription. Sub. Department, RADIO WORLD, 1493 Broadway, New York City.

Manufacturers and Dealers, Attention!

If you can use a great list of names of people who want radio goods throughout the country you will find them in the Merchandising Department of Radio World, starting with our issue of April 14 and in every issue to date. Any copy mailed you for 15c. each from April 14 to July 7 or the entire twelve for $1.50; or send $6.00 for a yearly subscription starting with our issue of April 14. RADIO WORLD, 1493 Broadway, New York City.

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By M. B. SLEEPER

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THE COLUMBIA PRINT

1493 BROADWAY, NEW YORK CITY

RADIO BROADCASTING MAP

FOR the benefit of those interested in Radio and those who are becoming interested, Rand McNally & Company have prepared a publication containing a wealth of information of greatest value. It shows, in the most comprehensive way, the location of the broadcasting stations, gives their classification, the call letters, wave lengths, ownership, etc., of each.

The Rand McNally Radio Map of United States is 28x30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover.

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Standard of the Radio World, 130 separate units, each fully Guaranteed.
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Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:

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Regenerative Radio Frequency Circuit for 5 tubes	March 24
Hazeltine Neutrodyne Receiver	March 31
2VK'S Transmitter circuit	April 21
Compact Universal Receiver	April 28
Stockelberg Pup receiver	May 5
Cockaday receiver	May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Blenartz	May 19

Any number for 15c. Any 7 numbers for $1.00. All 10 numbers for $1.35. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

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RICHARD B. OWEN
Patent Lawyer
32 Owen Building, Washington, D. C.
2276-P Woolworth Bldg., New York City

Local Commercial Radio Service in Denmark

RADIOTELEPHONE connection between Copenhagen and the island of Bornholm in the Baltic Sea, heretofore poorly equipped with means of communication, is now an accomplished fact, Trade Commissioner Sorensen reports. Radiotelephony between the two points is now open to the public. The radio circuit, which consists of the four stations of Amager, Lyngby, Hammeren and Ronne Radio, is based on the Poulsen arc system, manufactured by the German firm of Lorenz. The installation permits of communications in either direction simultaneously. The radio is connected with the ordinary Copenhagen telephone system, so that any subscriber may ask for a number on Bornholm Island and get connection. The cost for a call is 3.50 crowns for a three-minute period.

One of the Types You Meet

HE comes down to the office looking as though he had walked all night with his darling child. He is continually reading radio magazines, he talks radio, he eats radio, he sleeps radio and he works radio.

When you go out to lunch with him he always takes the lunchroom next to a radio store, bolts his sandwiches and coffee, and then stands outside of the store and looks longingly at some particular piece of apparatus. Then suddenly he gets an inspiration, goes in and buys some funny looking thing, comes out with a broad smile and hustles through his afternoon's work so as to be home early.

Next morning he comes in looking seedier than ever. When you ask him what is the matter, he spouts a bunch of station calls all over his vest and looks like a miner that has just picked up a ten pound nugget and hasn't a relative in the world. THAT'S HIM—THE RADIO BUG!

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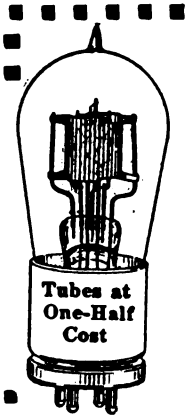

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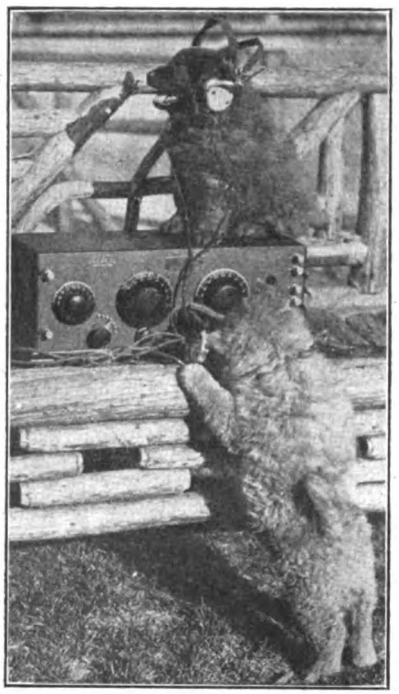
Chows Listen In For Prices of Chow



(C. Underwood and Underwood)

No brethren, this does not signify that radio is going to the dogs, but it does show that even Chinese Chows (aristocrats of dogdom) appreciate something out of the ordinary in a good concert. The announcer at the time this was snapped was giving the price of prime knuckle bones and Chinky, sitting up atop the set, is having a hearty laugh at the fact that they dropped three cents per pound. Blinky, down below, is hard of hearing in the right ear, so he takes the initiative of listening with his left ear in between both phones so that he won't miss a single price.

Suggestion to Song Writers

WE have had songs about Dear Old Dad, and Dad's Wife, and Sweetie songs, and Dearie songs, and Banana songs, and Mamma songs, but what a reader wants to know is who is going to write that popular piece (it's bound to be popular, and think of the millions that it will hit) "My Ma's Got the Radio Bug Now," or "Pa, Turn the Juice Off, Soup Is On the Table."

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MARY: "Huh, smarty! My father is a bootlegger."

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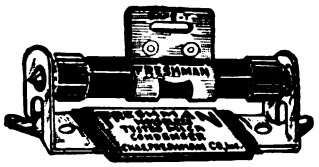

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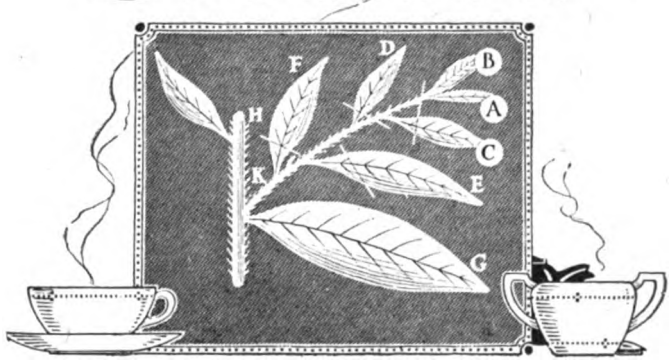
The A.B.C. of Good Tea



THIS diagram shows clearly one reason for the superior flavor, strength and aroma of RIDGWAYS TEA.

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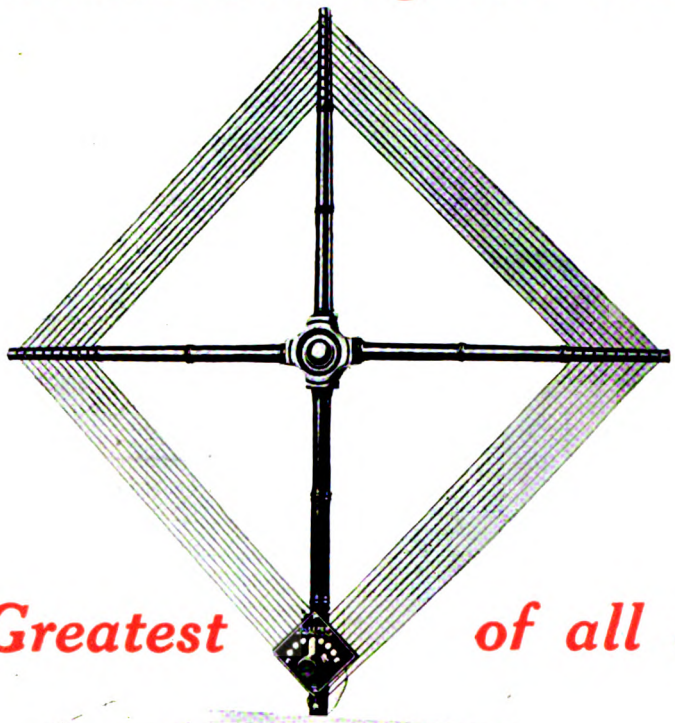

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3 Tubes do the work of 5 with no outside wires

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WITH exclusive rights to the famous Grimes Inverse Duplex Circuit we were bound to build the most perfect Radio Set in America.

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The twirl of a single dial—the "Monotrol"—tunes in or out all stations. You will always pick up the same station at exactly the same number on this dial and selectivity is so great that you can tune through powerful local stations and catch distant stations without the slightest interference.

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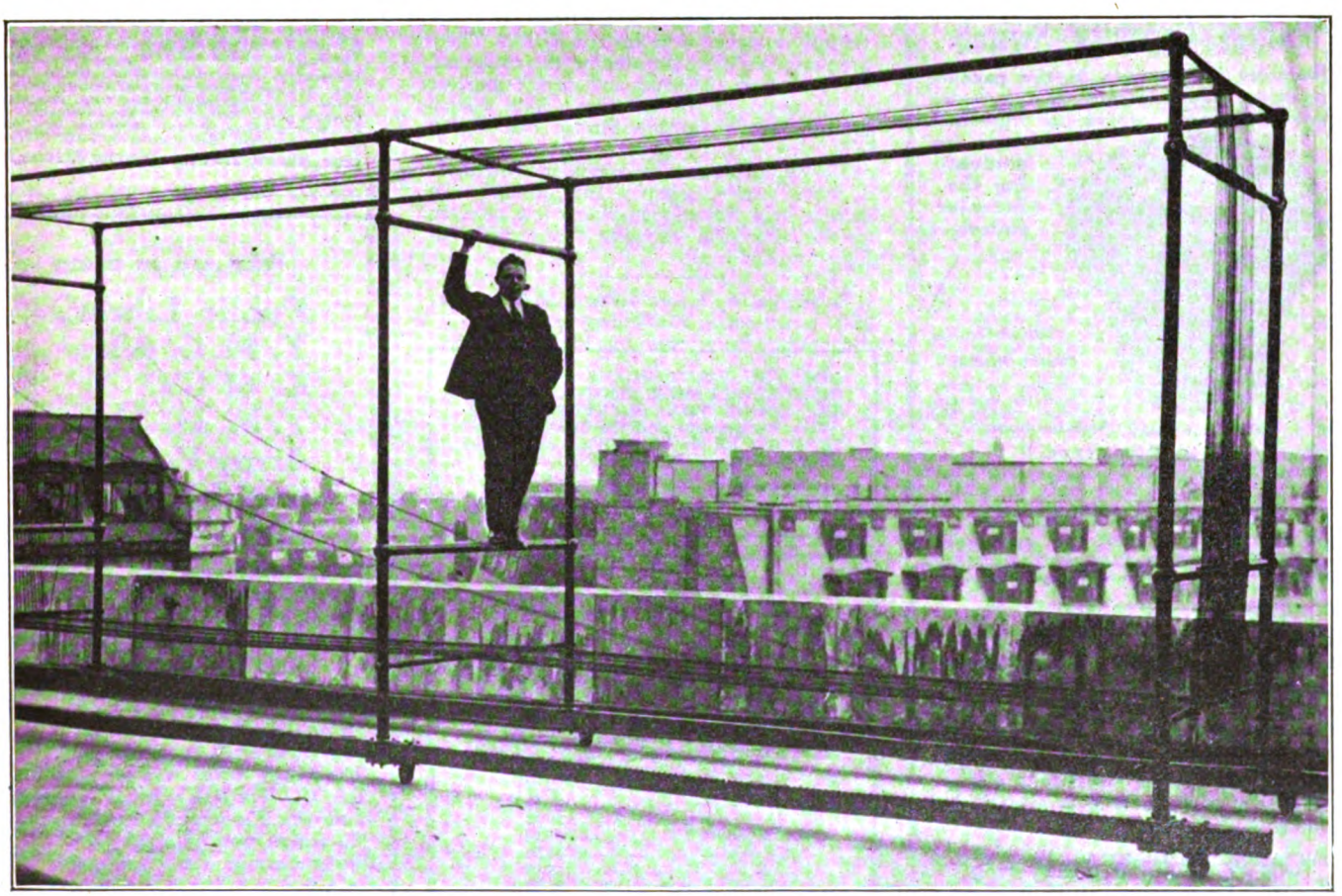

(C. International Newsreel)

This illustration shows the largest cage aerial in England, on the roof of the new Bush House, England's largest and newest building used by business concerns. The United States Shipping Board has its offices in the new edifice and maintains a powerful radio station which is in direct communication with Annapolis, Md. Messages are picked up and sent across the Atlantic without resorting to relaying. Mr. Redmond, who installed the great cage aerial, is shown in the picture.

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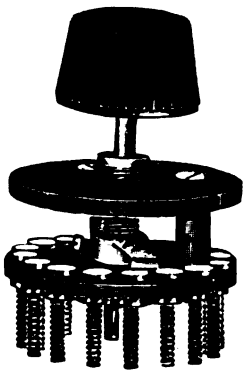
Aetaco Back Mounting Inductance Switch



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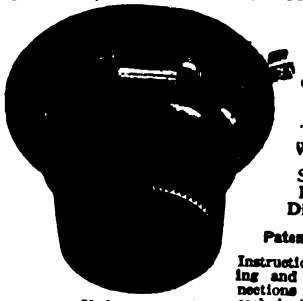

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Radio World, 1493 Broadway, New York City

Col. Green's Loud Speaker Causes Protest

STATION WMAF, owned and operated by Col. E. H. R. Green at his summer home at South Dartmouth, Mass., which was illustrated and described in last week's RADIO WORLD, is the subject of a protest from the residents of Nonquit, Mass., six miles away. The battery of loud speakers mounted on top of a water tank is causing the objection.

With a desire to let his neighbors share the programs from prominent broadcasting stations, Col. Green not only installed the loud speakers, but allowed free entree to his estate and even provided automobile parking space. Hundreds came nightly. Scores of automobiles lined the road and parked in the meadows.

Colonel Green and his guests enjoyed the experiment, but the Summer colony at Nonquit, six miles away, did not. First came a faint stir of protest and then a roar. Colonel Green was surprised by the protests, so he has announced that the concerts will be discontinued until horns and mechanism can be so arranged that the sound will not carry to Nonquit.

Bishop Bars Amplifier from Altar

BISHOP WILLIAM T. MANNING has ordered removed from the high altar of the Cathedral of St. John the Divine, in New York City, a receiver for a system of amplifiers.

"Nothing of a worldly nature should be in this sacred place," he is quoted as saying. "Besides, communicants should know their service by heart, and it should not be necessary for them to hear the words of the celebrant."

The altar receiver was a part of a system recently installed at a cost of $9,000. There are nine amplifiers throughout the cathedral, and now even the choir and clergy can hear every word of the sermon. The bishop himself, seated on his throne, can "listen in."

No objection to the amplifier system as a whole was made by the bishop. He merely held that the placing of a receiver on the altar was carrying "modernism" a little too far.

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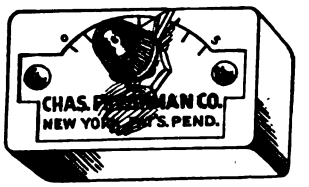

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broaday, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 18. Whole No. 70 July 28, 1923 15c. per copy, $6.00 a year

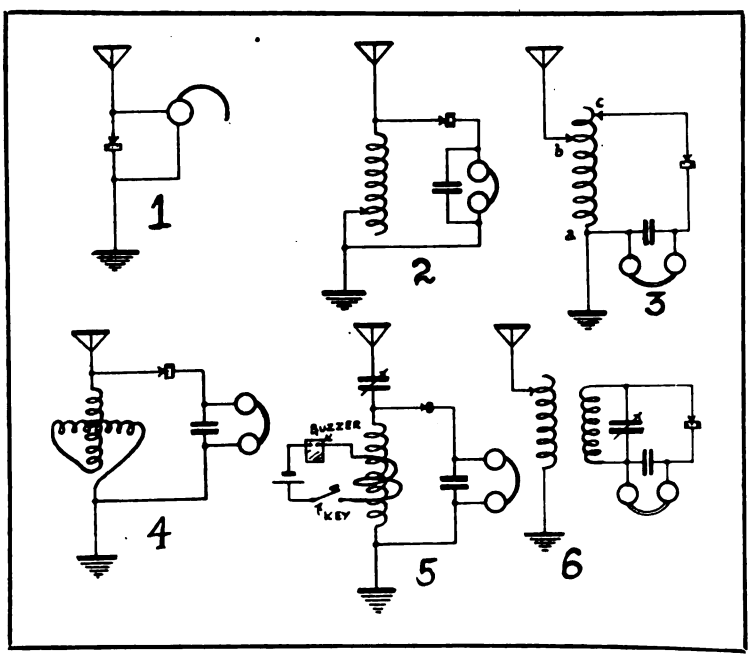
Single Crystal Sets for Broadcast Listeners

By Kenneth M. Swezey

MANY aspirant broadcast fans become discouraged when their glances at every turn collide with a complicated diagram or a high price. In its year or so of existence, the army of listeners has advanced to such a degree that the radio shops and the magazines have to keep going at a good pace to satisfy its demand. The result is that the beginner with the very modest pocketbook is often forgotten. Not so very long ago the question when fan met fan was this: "What kind of a crystal are you using now?" Today the question would be more likely, "What kind of a tube do you recommend for the sixth amplifier stage?" Yes, times have changed; but crystal sets are as good now as ever they were, and, within their limitations, will give very satisfactory service.

In the first place, crystals are very efficient as radio detectors; even much more so than the vacuum tube. Although sometimes they are rather difficult to adjust and to keep in adjustment, they do not distort the incoming waves. The chief thing to recommend them to the beginner, however, is the simplicity of the crystal set and the comparative inexpensiveness. The disadvantages might include the lack of stability and sensitivity as compared with the vacuum tube. Located within 25 miles of a good broadcasting station, and used with ear-phones, a crystal outfit ought to give very satisfactory results.

The simplest form of a crystal set that is workable consists of a detector, a receiver, and the usual aerial and ground connections. This circuit, shown in Fig. 1, is the type generally used in "tie-pin," "nut-shell," and other very tiny sets. The disadvantage is that such a set cannot be tuned, but must respond to waves whose lengths approximate that of the natural wave length of the aerial and ground system.



Figs. 1 to 6. Simple circuits suitable for broadcast listeners.

In Fig. 2 we have the simplest crystal circuit that is really practical. In addition to the crystal and phones, it has a small fixed condenser and a single slide or tapped tuning coil. The condenser is not used for tuning at all, but merely affords a by-pass for the radio-frequency waves around the high resistance phones, and also stores the audio-frequency rectified waves and discharges them at the proper time through the receivers. The tuning coil generally consists of a number of turns of insulated wire wound around an insulating cylinder, or tube, and having a slider that can be adjusted so as to make contact with any desired turn. For broadcast reception, with a 100-foot aerial, the coil could very well have about 80 turns on a three- or four-inch tube. The tuning is accomplished simply by moving the slider back and forth, cutting turns in or out as desired.

By adding another slider we have the more selective set, shown in Fig. 3. Here we really have a two-circuit receiver, with what is known as *conductive* coupling. The turns of the coil that are included between a and b might be considered as the aerial circuit, or primary, and the turns between a and c, the closed circuit, or secondary. This is quite a good circuit, is fairly selective, and is widely used by beginners. In many cases rotary switches and taps are used in place of the sliders, thus allowing better mechanical construction and mounting on a panel.

For short waves, the variometer lends itself very well as a tuning device, in the manner shown in Fig. 4. With one of average design, a range of wave length

(*Concluded on next page*)

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Single Crystal Sets for Broadcast Listeners

(*Concluded from preceding page*)

between 300 and 500 meters ought to be secured without difficulty. Such a set would have but one control to manipulate, besides the detector adjustment. For longer wave lengths a loading coil could be connected in series.

Fig. 5 shows a crystal circuit that is quite good for short wave work. Here the tuning is accomplished by means of a variable condenser of about .0005 to .001 mfd. capacity in series with a fixed coil. The fixed coil, in this case, is not a useless piece of loading, but is included to sharpen the tuning qualities of the circuit. A long aerial wire has good absorptive qualities, but it does not allow of the sharp tuning that could be obtained by the addition of a concentrated inductance in the form of a coil.

This diagram also includes a buzzer test outfit, which device allows the adjustment of the detector at moments when there are no stations coming in. It consists of simply an ordinary buzzer, or one of the high frequency type that are made especially for the purpose; a dry cell; a key, switch, or push button; and a small coil of a few turns of wire which is placed near, or in inductive relation to, the fixed tuning coil. When

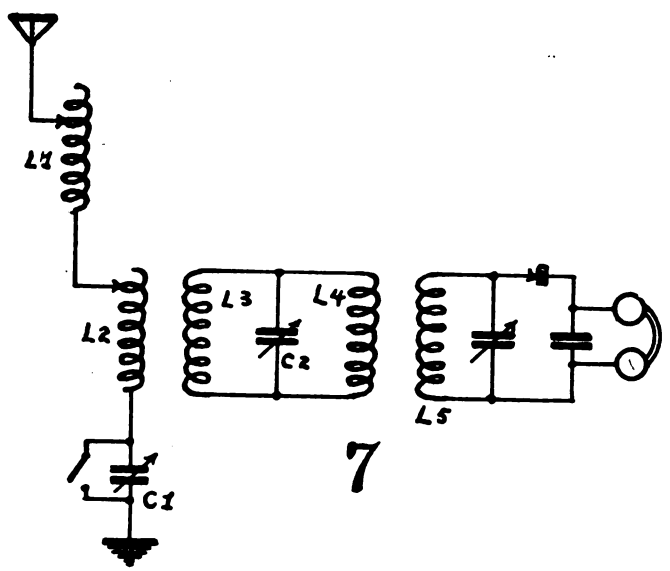

Fig. 7. Crystal set circuit which is quite selective.

the buzzer is in operation, the detector can be adjusted to its most sensitive point without the aid of incoming signals. This test outfit can be used with any of the sets described.

The crystal receiving set that has two distinct circuits is slightly more complicated than those just mentioned, but in a number of ways it is more satisfactory; the most important is that it is more selective. Sets having loose couplers or variocouplers are of this type. The coil that is in the aerial circuit is called the *primary* and the one in the detector circuit, the *secondary*. If the secondary has a fixed value, a variable condenser is usually connected across it to vary the wave length. For broadcast reception, the primary should have about 80 turns, and the secondary—if it has a variable condenser across it—should have about 40 turns. To get such a set into operation the detector must first be adjusted, if you have a buzzer test, and the secondary condenser set at some arbitrary point. Use very close coupling between the two coils. Now move the primary slider, or adjust the primary switch, until a station becomes audible. Next adjust the secondary condenser for maximum response. A change in the coupling might now make the signals louder, or reduce the interference from another station that is not desired. Loose coupling will tend to reduce static disturbances, as static is less capable of jumping between coils that are inductively coupled than are radio oscillations.

An arrangement that is still more selective is shown in Fig. 7. Here we have an intermediate circuit consisting of fixed inductance coils L3 and L4, tuned by the variable condenser C2. The aerial coupling coil L2, and the detector circuit coil L5 are not in inductive relation to each other, but are connected solely through the intermediate circuit. In practice, two variocouplers would do very well for the four coils mentioned. The primary of one as L2, the primary of the other as L5; and one secondary as L3 and the other as L4. The two couplers should be separated at least six inches. C2 is an ordinary .0005 mfd. variable condenser. If waves beyond the normal range are desired, the loading coil L1 may be included in the circuit. For shorter waves put in the series condenser C1. For some of the lower wave lengths it may be necessary to have a fewer number of turns on L3 and L4, than that of secondary of the average coupler.

Crystal detectors are voltage actuated devices, and therefore it is desirable to have a preponderance of inductance, rather than capacity. That means that wherever possible, coils should be used in preference to condensers. This, however, does not apply to the phone condenser. This last named condenser should, for usual practice, have a fixed value somewhere between .001 and .005 mfd.

The crystals that are used most at the present time for detectors are galena, silicon, and a few synthetic crystals that go under different trade names. Of natural crystals, galena is the most sensitive, with silicon as a fairly close second. However, a great deal depends upon the individual crystal. Some of a particular kind are extremely sensitive, while others are just the opposite.

There is a mistaken impression that crystals must be changed every few weeks or months. This is unnecessary. The author has a good piece of galena which he has used in a detector over a period of eight years, without even having a cleaning, and without any appreciable signs of deterioration.

Exposure to the air causes a thin film of oxide to accumulate, which might render the crystal less sensitive. Handling with the fingers renders a crystal insensitive, by depositing on it a coating of oil or grease. If oxidized, a new surface may be prepared by scraping with a knife; or better still, by splitting off a thin layer, along the line of cleavage, which is most likely parallel with the present surface. An oil film may be removed with alcohol or ether.

The knack of finding the sensitive spot comes with experience. The crystals above mentioned require a very light contact for maximum sensitivity. A long straight or coiled, catwhisker or phosphor bronze, with a rather sharp point, does fine. Scrape the point occasionally to remove any accumulation of grease and dust. Mounting the detector on a rubber or felt base will tend to prevent the adjustment from jarring out.

Except in rare instances, a crystal set cannot be used with a loud speaker. And except when very close to a broadcasting station, it cannot be used with a loop aerial. There are no crystal regenerative sets, but crystal detectors are used to good advantage, in connection with vacuum tubes, in some of the new reflex circuits. Vacuum tube amplification may be added, if so desired.

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Army Center Handles 322 Messages Daily

By Carl H. Butman

WASHINGTON, D. C.—All War Department telegrams, cablegrams and radio messages are handled directly through the Army Message Center located in the Munitions Building, and under the direction of Maj. General Geo. O. Squier, Chief Signal Officer of the Army. An average of 322 messages a day is now handled, the bulk of the dispatches being sent and received by radio.

As a financial saving to the government, the Message Center is a unique factor. Through the operation of its radio it has reduced the telegraph tolls from $5,500 in July, 1922, to $1,650 in March, 1923. It is a "paper" saving, based upon commercial rates. The peak of traffic was valued at $6,599 on May 1, but in July the estimated value of the total traffic at commercial rates will be about $9,000.

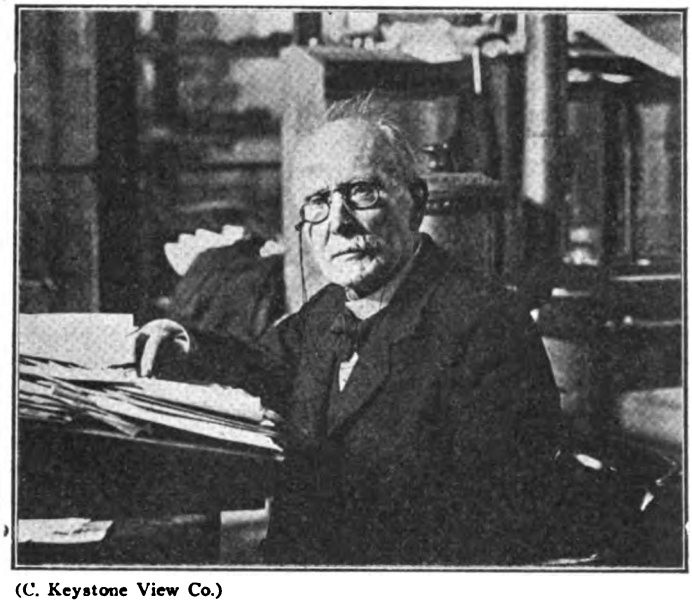
Through the use of its radio net, now including 112 stations in every corner of the country, the Message Center handled 62,222 official radiograms, totaling 2,235,417 words during the last calendar year. If this traffic had been handled over commercial telegraph lines, the cost to the Government would have been $38,202, but the Army cost was only $18,039, exclusive of enlisted operating personnel. The saving to the country amounted to $20,163.

The Message Center presents a busy scene at any hour of the full twenty-four during which it is operating. The central office where Capt. R. B. Wolverton presides, handles all messages from the many bureaus of the War Department in Washington. Both in and out messages are cleared through his office. Near at hand is the telegraph room, moved three months ago from the War Department, where all Army telegrams are sent and received. In another room are four loop radio receiving sets of the latest Signal Corps design. Reception of the many outlying radio stations is handled by four rotable loops on the roof of the building. The loops are revolved to the proper angle for receiving a station by long brass rods subtending to the radio room below. Two operators are on watch constantly, but by means of schedules traffic is handled at specific hours.

Arlington is the sending station for all outgoing government radiograms, the Army sharing the station with the Naval Communication Service. Three sets at Arlington are controlled directly by land line during certain periods of each day by the operators at the Army Message Center. Special lines for signalling the Arlington electricians parallel the remote control lines. One set is used primarily for communication to Air Service flying fields on 1,500 meters. Another set operating on 1,900 meters is used for sending dispatches to Fort Hayes in Ohio, and Fort Bragg, N. C. The third is a tube set transmissing on 2,650 meters, used for communicating with Fort Benjamin Harrison, Ind., and eventually Fort Leavenworth, Kan., and Fort Douglass, Utah, when the new 10 KW tube sets there are completed. Fort Leavenworth is expected to be ready for operation by August 1st.

High speed transmission and reception has been tried out with good results. With the Kleinschmidt automatic apparatus which sends from a perforated tape and receives by recording in Morse dashes and and dots on a tape, a speed of at least 100 words per minute is planned between Fort Benjamin Harrison, Ind., and Washington. The type of high speed apparatus is capable of 150 words per minute, and it is

Transmits Light by Radio



(C. Keystone View Co.)

This is the "Father of Wireless in France," Edouard Branly, of Paris. He is sometimes known as the Grand Old Man of Wireless owing to his early invention of the coherer. He now claims to have succeeded in transmitting by wireless a luminous point and a circle of light, thus opening up the possibilities of vision by wireless. M. Branly is 77 years old, an eminent scientist, and was elected to the French Academy of Sciences in 1911.

South Dakota College Man Saves Ship by Radio

YANKTON, S. D.—Stranded for eight days on an island in the Mediterranean, after an accident in which two sailors were killed, the S.S. "Manhattan Island" was rescued by destroyers through a distress message sent out by the radio operator, Homer Fitch, formerly a boy amateur of this place and member of the American Radio Relay League.

A report of the accident and the part played by Fitch was received here from Constantinople to which port the "Manhattan Island," a government Shipping Board vessel, proceeded after having been dredged out of the sand by vessels coming to the rescue.

The vessel was on its way to Constantinople from Palermo, Sicily, when it ran aground. Fitch, who is only 19 years old, was the only operator aboard and it was his skill at the key, gained while an operator at the Yankton College radio station 9YAK, that brought the desired aid to the ship stranded on the island shore.

At one time a student at the college, Fitch will exchange his officer's uniform for a football suit next fall. He made his letter for the last two years as guard and center. He obtained his first position as radio operator through friends in Texas whom he knew only through communicating with them by radio. expected that it will prove efficient in handling traffic during peak loads.

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Radio and the S. S. "Leviathan's" Trial Trip

By Pierre Boucheron

ONCE a telegraph operator, always an operator. Whatever effect the dots and dashes may have on the psychology of a person who becomes a master of that staccato language the facts remain that the clicks of the sounder or the buzzes of the radio have a fascination that never dies.

And the latest proof of this simple philosophy is to be found in what transpired aboard the great ship "Leviathan" during her recent trial trip from her berth in Boston harbor to the warm waters of the southern Atlantic and back again to New York City. While press accounts have been replete with details of the huge liner's notable passenger list on that occasion, of her gigantic dimensions and her splendid appointments, of her reconditioning from a troop transport of the stirring days of war to our mightiest merchant ship, and of the startling records made during the trial run, little has been said or written regarding the radio equipment of the "Leviathan."

Yet when the huge liner set out on her trial trip under the critical gaze of the American public the time had come for the acid test of the super-radio plant installed on the new "Leviathan." Soon messages began to pour into the radio quarters aboard from men of every calling, for her list of guests was a representative cross-section of American business and public life. Soon there was a large volume of radio traffic from passengers aboard to relatives and friends and business associates ashore.

So far so good. But shortly after, when the chief radio officer, E. N. Pickerill, called the radio coastal stations and announced to America at large that the flagship of our merchant marine was under way, these stations flashed back the significant information that they had batches of urgent messages for the "Leviathan," all ready to be transmitted.

Pickerill, old-time operator that he is, with a wealth of experience and a skill that is second to none, was in a quandary. The notable passengers aboard were besieging Pickerill to dispatch their radiograms post-haste, with ever-increasing volume of dispatches; while the coastal stations were pressing him to take their radiograms without delay. Never before had such a problem presented itself to a ship radio operator.

It was at this point in radio affairs that David Sarnoff, vice-president and general manager of the Radio Corporation of America, and a guest on the "Leviathan," happened into the radio cabin to look things over. Mr. Sarnoff was in a sports suit and smoked a large cigar, obviously set for a few moments of leisure snatched out of a tireless business activity. "How is traffic?" he inquired of Pickerill. And the latter, surrounded by a rising tide of radiograms, hastily explained the extraordinary situation to the executive.

Now Sarnoff is a man of action. He knew that something had to be done, for the radio equipment of the "Leviathan" was just as much under the scrutiny of the American public as the turbines or the crew or the guests of that ship. The traffic had to be handled without loss of time no matter how voluminous it might be. So Sarnoff repaired to Mr. Lasker's stateroom, where he discussed the situation with the head of the U. S. Shipping Board. "I believe," concluded Sarnoff, "that the American public is entitled to know as quickly as possible, through the medium of the newspapers, of the progress of the finest liner under the American flag. For that reason I believe we should temporarily withhold transmission from the shore stations in favor of the 'Leviathan's' transmission." Mr. Lasker agreed. So did the men of affairs aboard the great ship. Soon Sarnoff was instructing all shore stations to receive press traffic from the "Leviathan" first, and when all the radiograms had been dispatched from the ship they could, in turn, transmit their accumulated messages.

With the plan of action settled it was quite another matter to reduce the pile of radiograms that had collected in the radio cabin. Sarnoff required no consultation with any one in solving this problem, for he is the man who, ten years back, while stationed in New York, received the dispatch from the steamship "Olympic," 1,400 miles out at sea, giving the first confirmation of the sinking of the "Titanic" after a crash with an iceberg. He is also the man who, seven years ago, when radio telegraphy alone was considered an accomplished fact, presented a detailed plan to his superiors, which conceived a simple radio telephone "music box" for every home boasting of a talking machine. This plan is today in actual use in the form of radio telephone broadcasting.

Little wonder, then, that Sarnoff, the man who has been through every stage of the radio business, from messenger boy to radio operator, and then to inspector, engineer, commercial manager and traffic manager, and then, still higher, to vice-president and general manager of a great radio corporation, felt the irresistible urge once more to handle the traffic of America's pride of the seas. In a moment he was a changed man. All his executive problems—if he had them on his mind during what had started out to be a restful trip—were temporarily put aside, and Sarnoff set himself for the task of clearing the accumulating radio traffic, giving Pickerill a much-needed reinforcement.

With his coat thrown off and sleeves rolled up Sarnoff took his place at the key, while Pickerill relayed the message blanks for G. Harold Porter, general marine superintendent of the Radio Corporation, and also trial trip guest, who took the bundle of messages presented by newspaper men and others at the doorway of the radio cabin. News soon passed around that Sarnoff had assumed the role of chief communication officer, and in a short while radiograms aggregating 15,000 words or more were placed before the telegraph operator, who at one time was the fastest in the service.

The limit of physical capacity for transmitting radiograms was soon reached. It was at this time that Pickerill, sizing up the situation, hit upon the idea of starting up another transmitting set for the purpose of handling part of the ship's traffic on another wave length, it being at the same time that Sarnoff was steadily unloading the radiograms that lay before him, thus relieving the pressure brought to bear by an all-but-overwhelming traffic. The generators were started, and shortly the second transmitter got into action on another aerial provided for emergency use. A hurried call to the nearest coastal station was answered by "Get you fine. Shoot your messages."

So two separate radio transmitters worked away on board the "Leviathan," with Sarnoff at one key and Pickerill at the other—two star operators intent on their work. The two transmitters sent and received at the same time without mutual interference, each communicating with

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its own shore station. The rate of dispatching the radio traffic was, of course, doubled. The pile of radiograms soon melted away under this relentless onslaught of skilled operators as they were placed in the hands of the shore operators. The "Leviathan" was all the while linked on the one hand with a station at Boston, and on the other with the station at Chatham, Mass.

Sarnoff from that point on took his trick with the operators—namely, John R. Irvin, Anthony Tamburinio and R. J. Green—in four-hour shifts. Rarely have radio operators sat at their keys ticking away constantly for four-hour shifts. Aside from taxing their ability they became fatigued from their tedious job, but nevertheless one operator was always on hand to do a few minutes' relief work while the man on duty rested his arm, which was suffering from muscular strain. Two days after leaving Boston one of the operators became exhausted, and one of the relief men was snatching a few hours of well-earned sleep. Again Sarnoff answered the call. Attired in a tuxedo and after a hurried meal he arrived in the radio cabin, removed his coat and went to work again, pounding the key for two hours at a stretch, while Porter arranged for filing the dispatches.

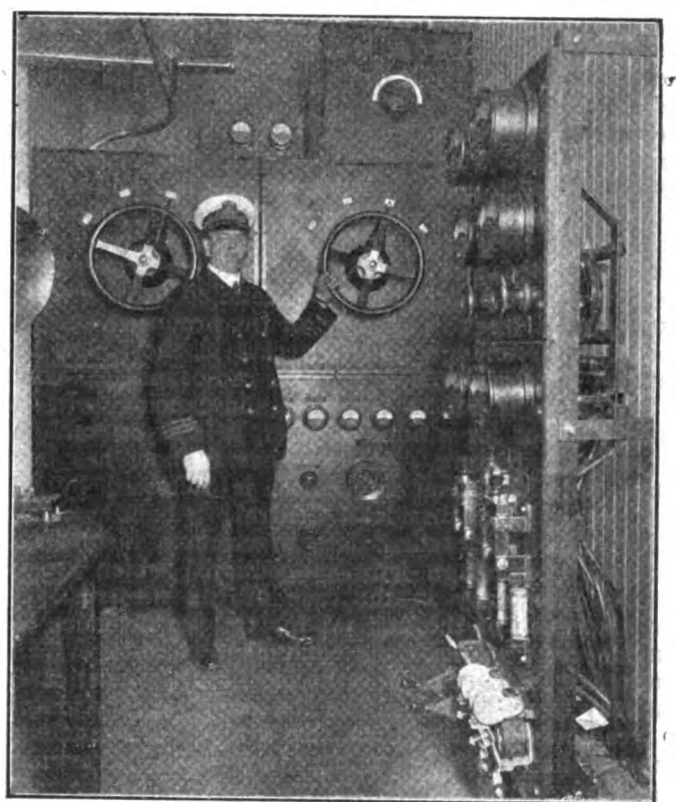
During the brief lull in the radio business Pickerill was reminded of the fact that he had promised to call his wife, living in Brooklyn, N. Y., via the radio telephone equipment—the only one, by the way, of its kind installed on a merchant ship. This feat was accomplished by calling the Bush Terminal radio station, which normally handles radio telegraph traffic from and to ships at sea. After testing out the set Pickerill's voice went on the air. "Hello, Bush Terminal! Please call Mrs. Pickerill on the telephone when you get a chance and tell her everything is going fine," was the telephonic message of the chief operator.

Being the wife of a radio man Mrs. Pickerill has a radio set in her home, which she uses for receiving radio broadcast concerts. It so happened that Mrs. Pickerill was listening in when her husband's voice was sent from the "Leviathan," and she heard it perfectly. Upon receiving the voice message Mrs. Pickerill called Bush Terminal radio station by telephone, saying: "You need not bother with the message from Mr. Pickerill. I have received it at home."

Thus it will be seen that the radio telephone messages were readily heard by the very persons for whom they were intended. Indeed, the usual radio telephone is by its very nature an excellent means of broadcasting or disseminating information. In marked contrast the radio telegraph as employed in trans-oceanic work and for ship-to-shore communication assures a maximum degree of secrecy and privacy since the radiograms are in code and can only be deciphered by a skilled operator. For extreme secrecy the messages may be coded into cipher.

And so the "Leviathan's" radio equipment received its acid test, and was not found wanting in any particular. The main transmitter performed flawlessly, "pumping" from 30 to 40 amperes into the antenna. The auxiliary continuous wave transmitter of two-kilowatt capacity served to handle the overflow of traffic, as already mentioned. The radio telephone, of the duplex type, permitting two-way conversation, also did good work when called upon. The "Leviathan" even boasts two life-boats which are provided with radio equipment. These have not been, and, it is hoped, never will be, tried under actual conditions of service.

After the voyage was completed Mr. Sarnoff remarked that, due to the position of the "Leviathan" in tropical waters and the heat wave along the coast, static was abnormal. In fact, during all his experience as an operator prior to becoming an executive in the company, he had never listened to static of such great intensity and persistency. As a consequence, for the first time in the history of marine radio, it was necessary to use the Cape Cod high-power station and divert it from European communication to the "Leviathan's" business. The power and wave length of reception was then increased from four kilowatts and



(C. Radio Corporation of America)

High power tube transmitter on the S. S. "Leviathan." The picture shows the chief radio officer, E. N. Pickerill, changing wave length.

1,600 meters to 200 kilowatts and 16,000 meters. In diverting the high-power station at Cape Cod from European to ship communication the Radio Corporation of America in this instance placed at the disposal of the "Leviathan" radio facilities on shore costing about $2,000,000. Something like 40,000 words of press, private and official communications were exchanged between the giant ship and the American shore stations during the famous trial trip.

WRC, Washington, D. C., the Latest Broadcaster

WRC, the call to be assigned to the Washington Radio Corporation station this week, will identify that new station excellently, when it gets on the air. Officials of the corporation are planning to open the station on August 1, with due ceremonies and an excellent program, details of which are being arranged by the program manager Ralph Edmunds, formerly identified with several opera companies and moving picture interests. His active contacts with musicians and actors, it is believed, will serve Mr. Edmunds excellently in preparing and executing exceptional broadcast programs. WRC is a duplicate of the 2 K. W. New York station WJY and Z on Aeolian Hall, but at the outset, only about ½ KW of power will be used. All parts of the transmitter are in duplicate, so that in the event of a breakdown an immediate switch to the other circuit can be made to cover the emergency.

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How Broadcast Central Transmits from Theatres and Hotels in New York

By J. L. Bernard

FEW people who read the radio programs have a clear conception of what is meant by the phrase "this concert will be broadcast by Station WJZ by direct wire from the ——— Theatre" or wherever the event is held. The layman's imagination does not seem to favor the idea of using wires in connection with radio broadcasting.

The heart of the "direct wire" system used by Broadcast Central is composed of three main arteries. In addition to these three arteries there are nine additional permanent wires, from which lines are run underground to Aeolian Hall Building, thence to the control room of the station. Various other net works of wires are tapped off, and which lead to the station from the main circuits. This artery system enables Broadcast Central to reach many points in Manhattan, and affords the radio audience a multitude of concerts, talks, and plays which they could otherwise never receive.

When a Broadway production is to be broadcast, a member of the program staff is detailed to review the play about a week in advance of the proposed date—if the play has enough of its success in the songs and lines, it is considered a suitable radio subject, while if its success is due to costumes and dancing, with no entertainment for a blind listener, it is of no value as a broadcast feature. Assume that a show has been found suitable—what procedure is followed by the "outside crew" of Broadcast Central? About two days before the broadcasting date a wireman installs the necessary backstage wire connections, which are of course, temporary in the case of the theatres. On the afternoon of the day set for the performance the outside crew set up their equipment backstage. The microphone is concealed in the footlights in most cases, but may be suspended above the stage. Everything is in readiness by the time the first of the audience straggle in, and the announcer, arrives in full evening regalia to introduce the theatre audience to the radio audience. The announcer generally has a microphone just back of the scenes, so as to be in close touch with all that goes on, but occasionally is given a small dressing room, with interphone communication with the stage. As soon as the performance is over the microphones are removed.

In the case of the Goldman Band Concerts on the Mall, which are being sent out from Broadcast Central, the wire is run through the trees in the Park, well out of reach of passers-by, to the main circuit, thence to the station by way of a lead-off. The wire is tied high up on one of the posts of the band stand, a table is requisitioned, and the microphone stands in full view of the leader. The announcer uses a separate microphone, and stands as near the leader as possible so that one may time his actions to fit in with the leader.

In St. Thomas' Church the installation is permanent, the microphone being properly located to effect perfect transmission from all parts of the service. There is a permanent installation in the Mark Strand Theatre and the music which is broadcast from this theatre every week has become one of the most popular of radio concerts. Everything is run according to schedule time, with no allowance for hitches or mishaps—not one has ever occurred. The theatre management has fitted up the screen room as a miniature broadcasting studio, and after the artists have completed their turns on the stage they may broadcast a purely radio program.

Visitors at the Waldorf-Astoria, the Plaza, the Commodore, and the Astor Hotels this past season have known the purpose of the little black disc suspended in the midst of the tea-room orchestra—but the uninitiated have wondered a bit. The little black disc is the microphone, the only part of the transmitting apparatus visible to the public. Hidden in the near background there are always two operators and an announcer. Because they always keep in the background very few of the diners and dancers at the various hotel roofs have realized that the music to which they danced was being sent out to all parts of the country—there is so little ostentation about it that it seems uncanny.

RADIO PRIMER

ANTENNA ERECTION: With the exception of sets employing loops in connection with radio-frequency, outdoor antennae have been the only method that the average amateur and fan have of receiving signals. Many erect an antenna without any thought as to the importance of various details that enter into its construction.

In order to be most efficient, the outdoor antenna should be clear of all objects such as iron structural work, tall trees and towers. To work properly, it does not have to be extremely high but should be high enough to clear all surrounding objects of this sort.

The insulation of the antenna is equally important. There is no sense of erecting an antenna if it is not well insulated, because poor insulation will only cause leakage of the minute currents with corresponding weakness in the received signals. The best insulators are those made of moulded composition with steel eyes in the ends. They are also the strongest and can be relied upon to stand up under any strain without rupture. If it is not possible to obtain these, the common porcelain cleat can be used. Two of these should be placed together for strength, and two sets of these at each end will give sufficient insulation, where a receiving set is concerned. The only bad point about the use of the cleats is the fact that they are very liable to become soot covered, and leak, but if they are cleaned every six months or so, they will stand up fairly well.

Another point that is generally neglected when an antenna is erected is the soldering of the lead-in wire to the antenna proper. If the wire is just wrapped around the antenna wire, the copper wire will corrode in time, and a poor connection will be the result. The lead-in wire should be soldered and taped and no trouble will be experienced from this end.

The bringing in of the lead-in wire is also another point that should not be neglected. A porcelain tube, or regulation lead-in insulator, should be used. In most cases the wire is just run through the open top of the window.

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A Circuit to Play Around With

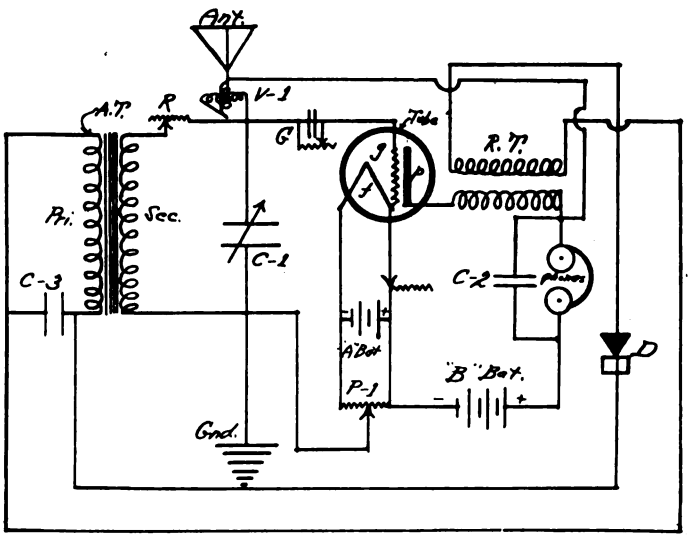
By C. White, Consulting Engineer

IF you are at present resting at ease and looking for something to play with I heartily advise you to fool around with the peculiar reflex circuit outlined in this brief article. But, before I start, I do not want anyone who has never built a radio set to decide to make this circuit his favorite receiver, because he will no doubt experience quite a little bit of trouble in making it work and the only man who can really make it function is the radio fan who has solved or assembled many radio circuits before and whose experience will be a guide to the correct results. Reflex circuits are always peculiar things to work because the constants for such circuits must be exact. In the particular circuit outlined I could get fair results with one audio transformer, no results at all with another, and still excellent results from a third. This in no wise reflects upon the quality of the various transformers, but it only goes to show that the constants of transformers greatly vary and you will always find that a certain one will fit a given reflex circuit better than any other for this reason alone. If you do decide to experiment with this circuit purchase a good reliable fixed crystal because an ordinary crystal will cause you much worry to get the right adjustment and keep the adjustment while you are changing things around in the circuit. At first you will discover that the action of the circuit is regenerative; that is, the crystal detector will make absolutely no difference at all in the circuit.

The schematic diagram gives the idea of the general assembly of the circuit. The variometer V-1 is no more than an ordinary variometer, and, the condenser C-1 is an 11 plate variable condenser. The resistance R should have a range of 1,000 to 100,000 ohms resistance. It is nothing more than a grid leak type of resistance. A grid leak resistance for the tube should also be variable, having such limits as advisable to employ with the type of tube used; that is, if a UV201A be used a leak varying from 2 to 5 megohms approximately should be secured. The grid leak condenser should be a fixed condenser having a capacity of .00025 mfd. The fixed condensers C-2 and C-3 should have a capacity of .002 mfd. apiece. The potentiometer P-1 must have about 300 or 400 ohms resistance, the latter value being more preferable. The audio-frequency transformer A.T. will play a large part in the correct performance of the circuit but it is almost next to impossible to specify any particular ratio because the right one will largely depend upon many constants of the other apparatus and wiring of the receiver. The radio-frequency transformer R.T. also plays a most essential part in the circuit and often by changing this around or trying another make you will discover very surprising changes in results.

After you have assembled the receiver keeping the grid leads as short as possible and you are all ready and set to listen in, most likely the first thing you will hear is a very strong alternating current hum. This immediately indicates one of two things, either you have made a mistake in the wiring and have an open circuit somewhere, or, the grid leaks R and G are not adjusted to the correct values. The latter is most likely to be the trouble and after playing around with these controls you will soon be able to alter the prevailing condition and eliminate the hum. After the hum is out of the way you will find that there are two ways to tune in a signal, either with the condenser C-1 or the variometer V-1, or maybe by varying both together. But, there is only one ideal condition and that is when the variometer is placed in a certain position and the final tuning is accomplished with the condenser. The wiring of the receiver permits it to be used as a regenerative circuit or a reflex circuit. You can readily ascertain which method you are using in the circuit by removing the fixed crystal detector D. If the signal completely falls out you know that the crystal was working, and if the crystal makes no difference in the volume then you know that the tube was acting as a detector. When the crystal functions you will note that the signal is much clearer than when the tube works alone, and the volume will be slightly greater. In reality there is a little combination of the two actions generally.

Although there is nothing wonderful or remarkable about this circuit, it does form a good circuit to experiment with if you have the necessary apparatus available. You will soon discover that there are many changes you can make and still have a good set or get clear reception. For instance, you can try removing



Schematic diagram of a reflex circuit that will surprise and delight the average fan who likes to have a little latitude in the construction of a set. It is important that a good ground connection be used with this set, because of the fact that a single circuit tuner system is used.

the grid leak and grid leak condenser G from the circuit and note the effect. Then try removing or varying R and note the changes. Change the size of the fixed condensers C-2 and C-3, change the types of radio and audio-transformers. Try out the various types of fixed crystals and discover which one gives the best rectification. I repeat that I do not recommend this circuit for the novice, that is, the radio fan who has never built or assembled a receiver. He is most likely to be puzzled at the various troubles that he will meet, but, the old radio fan will know from experience what to do. There are no parts in this receiver that are not standard and cannot be used in other circuits if you wish to do so later on, and therefore you will waste no money if you go to the expense to purchase a part or so to experiment with in this circuit. One of the greatest pleasures of radio I think is fussing around with new circuits, and it is very easy to do this experimental work if you live near one or more large broadcasting stations where you can experiment and test out your changes readily and without delay.

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Naval Airship Will Carry Radio to Pole

By Carl H. Butman

WASHINGTON, D. C.—When the great Naval Airship ZR-1 goes to the North Pole, she will carry radio to the top of the world, whether it is late this summer or next spring. If she reaches that northern pinnacle, and experts insist there is no reason to doubt her ability, the Naval airship will be able to prove the fact by virtue of her bearing from northern radio stations. In these days of scientific achievement proof is required, and in the event an arctic explorer gets to the pole with a radio compass or a transmitting set, there can be no doubt of his exact position.

Together with a complete radio receiving and transmitting set, the ZR-1 is equipped with the latest type of radio compass, which at the pole would show radio stations picked up as bearing directly south, while at all radio stations within communication distance, her position would be due north.

By the time the aerial explorers are ready to start their northern flight, toward the end of August, MacMillan's radio experiments from the "Bowdoin" will have proven whether radio will carry through the aurora, a point on which there seems to be some doubt. MacMillan, however, will not be able to take his set very near the pole, but will be forced to abandon it and the "Bowdoin" at the edge of the ice, leaving it to the Navy to carry radio to the pole itself. Weather Bureau officials report that messages from Amundsen's "Maude" have been received by relay, and that a daily message on meteorological conditions is received regularly during the winter months from Spitzbergen located at latitude 78 north. If it is possible to put radio messages through from the far north, the world will hear of the ZR-1's progress and her arrival over the northernmost point on earth.

While Rear Admiral Moffett, Chief of the Naval Bureau of Aeronautics, and the crew of the ZR-1 believe the trip is feasible and are literally "rarin' to go," the date of departure depends upon her flight trials scheduled in August. Since the trip would only require a few days it is possible that it can be made before the long winter of the north sets in with its low visibility and extreme cold, but if tests and flights are delayed until September the exploration cruise may have to be postponed until next spring. No details as to route have been mapped out. Two courses are being considered, however, one directly north from Lakehurst, N. J., her home station, and the other northwesterly to Alaska, using Nome as an advance base. From Nome the course due north would be 1,766 statute miles, a little over a good day's run. The British R-34 crossed the Atlantic and returned to England in 1919, traversing a distance of over 7,000 miles in a week's time, and in 1917 a German Zeppelin made a cruise of 5,500 miles in four days. The cruising radius of the Naval craft is between four and five thousand miles, so the distance of the polar trip is not considered extreme for this 680-foot craft.

Meteorologists and Captain Evelyn B. Baldwin, an Arctic explorer, point out that while surface winds from the far north blow in a southwesterly direction, at higher levels the warmer currents bear toward the north and would aid a polar flight. Captain Baldwin, who suggested an aerial polar flight years ago, recently talked to the ZR-1 crew on polar exploration, answering innumerable questions. Among other things, he explained the advantages of a summer flight, as against one undertaken in darkness and cold. A winter trip, however, radio experts point out would aid radio transmission materially. But with her radio operating from a 300 foot antenna at a great height, it is felt that the aerial cruiser would be able to send satisfactorily in the Arctic day as well as in the night. According to Ralph Upson's report to the General Electric Company, in using radio from his balloon at an altitude of over 3,000 ft., he encountered no static whatever during the recent balloon race.

Radio stations in the north are fairly numerous, and it is believed that the ZR-1, once on her trip could keep in communication with several to check her course. In the event she was uncertain of her position, she would either call two or more radio compass stations and ask for her position, or, having picked up two or more radio stations and observing their bearings by her radio compass, plot her own position. In this manner she could hardly go wrong and could correct her course readily provided her radio continued to operate successfully.

Incidentally, she could not "fake" her position at the Pole, as the world would soon be advised by radio stations that her reported position was incorrect. Captain Baldwin points out that in the far North, the compass is sluggish and that data for its correction are meager. It is his belief that the only accurate method of proceeding in the polar trips today is with the aid of radio and radio compasses.

Among the stations to which the ZR-1 could report are: Three in Iceland; Spitzbergen, on the 78 parallel; Ingoy, 71 N.; several in northern Russia; our own Army and Navy stations in Alaska; Jan Mayen station on Iceland, and Mijgbugton, 73 degrees N. on the coast of Greenland. Certainly there are sufficient to get cross bearings and correct the course northward. If the stations are equipped with compasses, all the better, but as the ship will have a radio compass, the reception of their signals is all the navigation officer will require.

The ZR-1 is equipped with a type S.E. 1390 transmitter, designed for flying boats like the N.C.-4 which made the record trip across to England. It has modifications, making it gas-proof.

The transmitter uses six 50-watt tubes giving it an input of 300 watts and an average output of 150 watts for wave lengths of 507, 600, 800 and 975 meters on I.C.W. and C.W. communication. It is possible to use this set for radio telephone work but it is not contemplated on the early flights.

The whole set has been tested on the bench with a phantom type having the same characteristics as a trailing wire antennae three hundred feet long, i. e., fundamental wave length 315 meters; 300 microfarads capacity; and 93 microhenries inductance, the resistance ranging through the wave lengths from nine to 13 ohms, giving a radiation of five amperes.

Arrangements will be made for an antenna for use when making a landing. It will be of the loop type fixed between the control car and the two leading wing cars and can be used for communicating when on the ground.

The airship's receiving apparatus will consist of a tuner of the ordinary two circuit type, in conjunction with a six-step amplifier using six S.E. 1444 tubes, three stages radio, a detector and two stages of audio am-

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Irving H. Kempner, who is now in Paris, France, disposed of a piece of New York City real estate by wireless last week.

* * *

Private radio messages have been made possible. Now if something could be done to make the phonograph more private. —Chicago American Lumberman.

* * *

The Soviet Government, according to the Russo-British Chamber of Commerce Bulletin, has recently prohibited the importation of the following articles into Russia: Non-insulated copper wires and cables; insulated copper flexible cables; various electrical products of glass and porcelain.

* * *

Hamilton Holt and Supreme Court Justice Daniel F. Cohalan debated the World Court question over the radio one night last week from Station WJZ of the Radio Corporation of America in Aeolian Hall, New York City. Mr. Holt supported the proposal that the United States enter the Court and Justice Cohalan opposed it.

* * *

Long-distance hypnotism by radio was demonstrated one day last week with apparent success at the offices of *Science and Invention,* New York City, when Joseph Dumninger, hypnotist and mind-reader, speaking into the microphone at Station WHN, Ridgewood, L. I., threw the subject, Leslie B. Duncan, into an hypnotic state in the office, ten miles away.

* * *

Captain Donald B. MacMillan, the Arctic explorer, now on his way north in the "Bowdoin," reported, one day last week, that Operator Mix had picked up amateur stations at Waterloo, Ia.; Belton, Texas; Wilmington, N. C.; Bordeaux, France, and many points in the eastern and middle western United States. Several concerts from the United States have been enjoyed by the crew of the "Bowdoin."

* * *

George W. Beauchamp, a retired Chicago business man, has had built for himself and family a "Pullman" touring automobile, in which he is making a tour of the country. It cost $12,000, is 23 feet long, six feet three inches wide, seven feet ten inches high, and has a wheel base of 196 inches. Sleeping and dining accommodations are provided for four persons—and, of course, the equipment includes a radio set.

* * *

Last Saturday evening a special program was given from Station WSAI, United States Playing Card Co., Cincinnati, Ohio. A wave length of 309 meters was used. Only one vocal artist appeared, but an effort was made to reach every state in the Union as well as Canada and Mexico. The artist appearing on this program is an American soprano, Mrs. Clara Thomas Ginn, who has a promising voice for the world's finest in broadcasting. She sang selections from various operas in French and English. Mrs. Ginn is a graduate of the Cincinnati Conservatory of Music.

* * *

One of the world's largest consumers of copper is the Southern California Edison Company of Los Angeles. The company now has 26,694,000 pounds of copper in service on its system. It is engaged in the largest hydroelectric development project in the world, involving an expenditure of $375,000,000, or $15,000,000 more than the cost of the Panama Canal. On its 600,000-volt transmission lines there are 8,838,000 pounds of copper and on its 30,000-volt lines there are 740,000 pounds of copper. It is estimated that the purchase of copper for 1922 was 6,000,000 pounds.

* * *

Gen. Gouraud, the French veteran now visiting the United States, keeps in touch with the country by means of a radio set installed on the private car "Berwick" on which he is making a six weeks' transcontinental tour.

* * *

An interesting feature was on the program of Station WOR, L. Bamberger & Company, Newark, N. J., last Wednesday night. Howard Thurston, premier magician of the present day, who is also a recognized authority on psychic matters, delivered a lecture, entitled "Spiritualism," during which he explained some of his new theories pertaining to the "after life," and also told how he happened to arrive at the conclusion that the belief in spiritualistic communication is founded on fact after a long series of experiments. For the past twenty years Thurston has been a relentless anti-psychic, and he has exposed many mediumistic frauds. When he recently announced that he had been converted into a "spiritist" of a new variety he created a sensation.

Radio Reports Prize Fight

(C. Acme Service)

More than two million people listened to the description of the Willard-Firpo fight broadcast direct from the ringside at Boyle's Thirty Acres, Jersey City, N. J., according to the estimate made by the American Telephone and Telegraph Company. The microphone, placed near the ringside, was connected with the apparatus of Station WEAF in New York City, and by long distance telephone lines connected with the transmitting equipment of WCAP, Washington, D. C., and WMAF, at South Dartmouth, Mass. The picture shows the radio equipment being set up on the afternoon before the fight.

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plification. The long range receiver will be one of new design having a range up to thirty thousand meters using as an amplifier. A universal amplifier of six steps with telephone jacks for using either radio-audio or audio alone in one or two steps will be employed.

The radio compass probably will be installed in the keel, just forward of the control car and may be used for taking bearings on wave lengths from 500 to 30,000 meters. This compass coil is rather unique in that it is of spherical shape and has two sets of coils. In the long-wave reception all the winding are used but in the short-wave reception it is divided into two coils and the variometer effect is taken advantage of.

The airship's name will constitute her radio call, just as the WR-2 before her destruction answered to "WR-2." Lieut. J. H. Gouan, U. S. N., will be in charge of radio, assisted by Chief Radioman J. T. Robertson. The electric power will be supplied by a gasoline-engine driven generator and a 200-ampere hour storage battery, similar in operation to the electric power plant of an automobile. These units will supply current for lighting as well as radio purposes. The battery itself will have sufficient capacity to provide between one and two hours' operation for the radio set in case of a generator break down.

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Summer Interest in Radio Is Good This Year

FOR many reasons interest in radio is likely to be maintained this summer to a far greater extent than last year, according to the radio experts of the Bureau of Standards. The maintenance of this interest and of good radio business during the summer depends very largely on the broadcasters and radio dealers.

Two elements of radio receiving sets which have been perfected during the last year or two have gone far to help in making it convenient and satisfactory to use radio receiving sets outdoors. The first of these is the dry battery tube; that is, electron-tube detectors and amplifiers which require only a small dry battery rather than a heavy storage battery to light the filaments. The second improvement is the development of more satisfactory loud speakers which furnish a considerable volume of sound without undesirable distortion. Thus it is possible now with small portable receiving sets which can be purchased or which can be fairly easily assembled, to receive satisfactory radio broadcasting while out camping or boating or making automobile tours. It is a noteworthy fact that exploring parties now take radio receiving sets with them for the dual purpose of furnishing amusement during the evening hours at camp and for receiving time signals with which to check their chronometers.

It must be recognized that radio transmission conditions are not as good in the summer time as in the winter. Transmission range is decreased so that it is not possible to hear the distant stations which can be received in the winter. The presence of atmospheric disturbances often makes it difficult to hear weak signals and reliance must be placed on stations which are near enough and powerful enough to produce loud sounds from the receiving set. Fortunately it is not necessary to rely entirely on distant stations since there are now nearly 600 licensed broadcasting stations in the United States. In fact, about nine-tenths of the area of the country and probably 95 per cent. of the population is within one hundred miles of a broadcasting station which furnishes quite satisfactory service. Therefore, while it has been possible during the winter to receive from any one of a large number of broadcasting stations, the summer decrease in transmission range will not mean an entire stopping of broadcast service for large numbers of people, but only a decrease in the number of stations between whose services they can choose.

There are a number of ways to minimize the interfering noise which is caused by atmospheric and other stray disturbances. At important government and commercial stations certain devices and methods are in use by means of which strays are appreciably reduced and it is made possible to obtain fairly reliable reception during the summer. The apparatus and methods employed at such stations are usually too elaborate to be used at the ordinary broadcast receiving or amateur station. One method which is easily employed and which will be found helpful in reducing certain types of strays is the use of a small antenna. If the ordinary open type of antenna is used its height and length may be reduced and the loss in signal strength recovered by employing a more sensitive receiving set. A coil antenna may be constructed by winding a suitable number of turns of wire with proper spacing on a wooden form about four feet square. In case a coil antenna is used there is some loss in signal intensity but there is an added gain in freedom from interference on account of the directional characteristics of the coil. Thus by rotating a coil antenna to the proper position the directional types of strays may be greatly reduced and a better ratio of signals to strays will be obtained.

Some relief can also be obtained by persons having good amplifiers by using a "ground antenna." This is a long insulated wire run in a shallow trench or on the surface of the ground. The ground wire should be run in the direction of the station from which the most signals are to be received and should preferably be several hundred feet long.

It is also worth while to use various means to improve the sharpness of tuning of the receiving set. Then such interference as is picked up by the antenna will to some extent be filtered out before it reaches the telephone receivers. The receiving set itself should be thoroughly shielded to prevent the tuning coils and transformer windings from direct induction from the source of trouble. Inductively coupled receiving sets should be preferable to single-circuit sets under these conditions. Radio-frequency amplification with sharply tuned inter-stage transformers is also helpful. A well designed regenerative receiving set is also very selective. If the receiving set is one which has a series condenser in the antenna circuit it is sometimes helpful to shunt the set with a high resistance (several thousand ohms) connected between the antenna and ground terminals. This may provide a shunt path for some of the interfering currents and avoid their entrance into the receiving set.

While the increase in the number of broadcasting stations in operation is an important factor in the radio situation this year, a still more valuable feature from the viewpoint of the listener is a very notable improvement in the quality of programs, and other features of operation of broadcast stations. There are now about thirty Class B broadcasting stations operating on individually-assigned frequencies between 1000 and 550 kilocycles (300 and 545 meters). These stations furnish programs of high quality and employ transmitting sets of 500 to 1000 watts power in order to secure the privilege of frequency assignment in this band. The large number of Class A broadcasting stations are also distributed over a range of frequencies from 1,350 to 1,050 kilocycles (222 to 286 meters). A number of these stations as well as some of the Class C stations operating on 833 kilocycles (360 meters) have well-designed transmitting sets and carefully selected programs. The assignment of broadcasting stations to frequencies differing by at least 10 kilocycles, in accordance with the recommendations of the Second National Radio Conference, has resulted in a decrease in interference and an improvement in the quality of broadcast service which is obtainable by the average listener.

Broadcasters Reassigned

Week ending July 14, 1923

Transfer Class C to Class A

Call	Station	Class	Frequency Kcys	Wave Lgth. Meters	Power Watts
WDAX	First National Bank Centerville, Iowa	"A"	1120	268	100
WPG	Nushawg Ptry Farm, New Lebanon, O.	"A"	1280	234	50
WJAM	Perham, D. C., Cedar Rapids, Ia.	"A"	1120	268	20

Transfer Class C to Class B

Call	Station	Class	Frequency Kcys	Wave Lgth. Meters	Power Watts
WOS	Missouri State Mktg. Bureau, Jefferson City, Mo.	"B"	680	441	500

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The Ideal Portable Receiver

By A. D. Turnbull

PORTABLE receivers seem to have captivated the popular fancy at the present time, partly due to the fact that people desire a receiver that can easily be taken away to the country with them or taken on a trip in a car. In order to be of any great use such an outfit should embody simplicity, ease of tuning, and efficiency to work on a comparatively small collector (antenna).

Under the heading of simplicity the size of the outfit must be small and easily adapted to portability. No one desires to take a set away that takes up half a trunk and needs storage batteries and an expert to operate.

The ideal portable receiver must not have a multiplicity of controls in order to accomplish reasonably fine tuning. Numerous condenser and inductance adjustments only tend to exasperate when signals are quickly desired.

As a loop antenna is to be employed and accommodated to a single tube receiver it is necessary to use the super-regenerative principle, that particular type of circuit giving the best and loudest signals possible on one tube. Unlike most "super" circuits, however, this one does not depend upon large inductance values. Advantage was taken of the principle on which the "flivver" circuits work and an extremely efficient receiver of moderate cost was the result.

The material needed for this portable receiver is: 1 variometer (preferably small size); 1 vernier variable condenser, .0005 mfd.; 1 fixed condenser, .006 mfd.; 1 fixed condenser and variable grid leak, .00025 mfd.; 1 fixed condenser, .001; 1 tube (U. V. 199, or dry cell tube); 1 tube socket; 1 loop antenna; 1 pair phones, 3000 ohms; 1 good vernier rheostat.

If you happen to have any of these parts you can use them, but I want to caution prospective builders to use only the best possible parts. In the choice of fixed condensers it is necessary to get those using mica dielectric. If paper insulated ones are used the difference in capacity in damp weather and dry weather will be so great that the set will not operate at all. Also do not use a condenser whose capacity you can change by squeezing. It is best to pay the few cents more that the best will cost than to buy inferior goods and then be disappointed in the results. In purchasing a rheostat be sure to get one that is capable of fine adjustment. For this reason it is best to get the carbon pile type, as their range of adjustment is extremely large, and very fine adjustment can be had by careful manipulation.

The entire set easily can be accommodate in a cabinet 10 inches by six inches by six inches. So get a panel that size and drill it for the variometer, variable condenser and rheostat, mounting them as your fancy suits you, but bearing in mind that as the variometer will be used the most it should be placed so as to be handy.

Shield the entire panel carefully with copper screening or foil and ground it to the minus side of the A battery. Watch out when shielding that your jack is clear of the shielding, as I managed to short my shielding on the jack, and wondered for some half hour what could possibly be the trouble.

When the panel is drilled, and everything is in readiness, connect up the instruments as shown with tinned bus bar wiring, using varnished cambric tubing on all of the leads. This is a necessary evil in all portable sets, especially where they are to be contained in small cabinets as the wiring is necessarily close and no chance should be taken with accidental short circuits due to jarring. When connecting the fixed condensers in the circuit take the precaution to mount them far enough from the shielding. If they are mounted too near the shielding they will add stray capacity to the circuit and the set will howl and act in general like a "mad dog" instead of a docile receiver.

No instructions are given as to the construction of a loop as numerous articles have appeared in RADIO WORLD on this subject.

The B batteries can either be carried as part of the set, or separately, depending upon the amount of voltage that is desired, always keeping in mind that the volume depends directly upon the voltage in this circuit. It will work fine on 22½ volts, but best results are to be had when 45 or 67½ volts are used.

After making sure of your connections and going over them several times before inserting your tube in the circuit, turn the filament on. Place the variometer at 50° and swing the loop in the direction of the station desired. When the signal or carrier is heard reduce the filament current and tune the variometer. During the first operation of the set, the high-pitched whistle or scream of the "super" will be noted. This should be varied until it is almost too high to hear, by varying the grid leak capacity. After it is set, it will be noted that it will vary slightly with the tuning of the variometer,

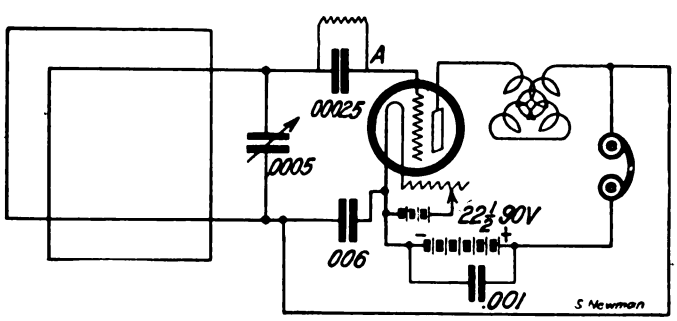

Diagram of a loop set employing the "flivver" principle that will work admirably on a comparatively small loop. Care should be taken in the construction and placing of the condensers.

and that the signals will always be the loudest when the pitch of this whistle is highest. This whistle should always be present, as if it stops, the circuit is not working correctly and the grid leak should be re-set until it appears.

The last operation of the set is clearing out the signals by means of the vernier control of the variable condenser. If any interference is noted it can easily be tuned out by swinging the loop, but in that case the entire set should be re-tuned.

Extremely long distance is possible with this loop set, and it is not an exaggeration when I state that I have consistently logged WDAR and KDKA on a 3-foot loop from Nova Scotia, which is a distance of 1,000 miles. It is simple to construct and tune and the dials can be set for certain stations and the same station will always come in on the same settings, regardless of anything else.

As a final note I again want to caution builders to be very careful in their construction, especially in the connection of the instruments, keeping all the leads separated and cross them at right angles. Do not vary one bit from the diagram and expect to get any results, as the circuit is simplified as it is.

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A Long Distance Sensitive Crystal Receiver

By Richard B. Wilbur

FOR radio fans who do not want to put much money into a radio receiving set, and who wish to get long distance stations, herewith are the details of a very sensitive crystal receiver, using an ordinary crystal detector. This set, if properly built and operated, will get results that will be surprising. The writer has a set of this kind that has received a station at a distance of 1,410 miles with plenty of volume and clearness of reception. This set is the tube's only rival.

The parts needed to construct it are as follows: 1 6½"x12" panel (any kind); 1 23-plate variable condenser; 1 .002 mfd. phone condenser; 2 switch levers; 18 switch points; 4 switch stops; 2 3" dials with knobs; 1 crystal detector (ball and socket type is best); 1 unmounted galena crystal; 1 empty shaker salt box (3½" inside diameter, 6" long); 1 3" rotor ball; 1 ¼"x6" tube for rotor shaft; 1 8 oz. spool of No. 22 DCC magnet wire; 1 ¼" board, the same size as the panel; 2 pieces of flexible wire, 6" long (leads for rotor).

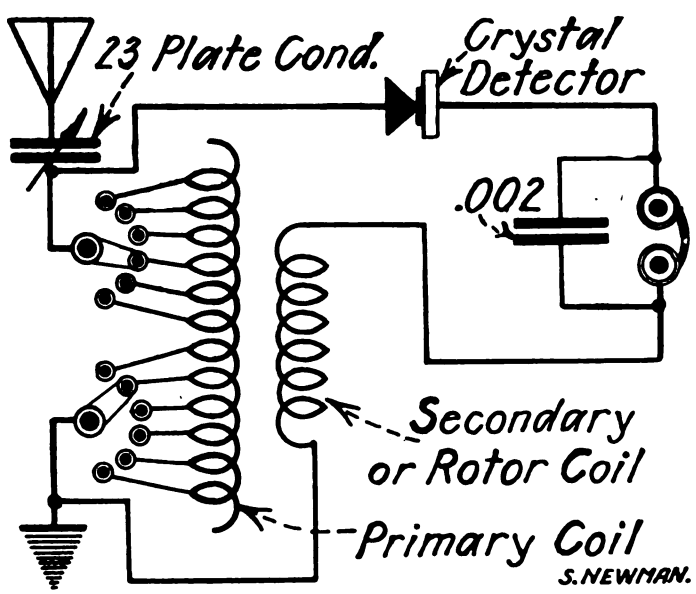

Fig. 1. Hook-up for Wilbur's long distance sensitive crystal receiver.

The total cost of these parts ought not to be over $6.50.

Use a variocoupler that will tune from 150 to 650 meters. It is best to make one yourself and it's a trifle cheaper than buying one—and it will be more efficient.

To make a coupler take the empty shaker salt box which will measure 3½" inside diameter, and 6" in length. Measure to the center of the box and make a mark. Now get a stiff piece of paper ½" wide, and measure around the outside of the box, commencing at the center mark. Get the exact diameter of the outside of the box, fold the strip of paper and cut. You now have one-half the diameter of the box. Take one of these strips and place one end on the center mark, hold tight on the box and mark the other end of the strip. Now then you have the marks on the box where you are to make holes for the rotor shaft.

In winding the primary coil, first make two small holes in the box ¾" down from the top, then take the wire and weave it through the two holes a couple of times to anchor it, and leave about seven or eight inches for a connection. Now start winding. Wind on 20 turns of wire (clockwise), then take off a 6½" twisted tap, wind on 30 more turns of wire taking off a twisted tap every fifth turn, and shorten each tap ½" each time; also stagger each tap a little, so that one will not be directly under the other. You have now wound the tube to the center, where the holes are for the rotor shaft. Leave a space ½" wide and angle across between the shaft holes and start to wind again, wind on 50 more turns of wire taking off a twisted tap every fifth turn. Take off the first tap after crossing the ½" space in the same position as you took off the first one in the beginning of the winding, and stagger them the same way. When the last tap has been taken off, cut and anchor the wire. The primary coil is now wound, so scrape off the cotton covering of the ends of the twisted taps.

The three inch rotor form is to be wound next. It should hold about 76 turns of wire. Wind each side of the rotor in the same direction, and solder the two wires together that meet in the center of the rotor. An inch of wire should be left at the beginning of each winding, so that you can connect the flexible leads.

Take the 6" shaft and cut a slot in it about 2" from one end. This slot will be for the flexible leads to pass through.

After this is finished, insert the rotor into the center of the primary coil and put the shaft through it, with the end that has the slot in to the back side. The two 6" flexible leads should be next inserted into the slot in the shaft and started out the end. Solder the flexible leads to the ends of the rotor windings and pull the slack out of the flexible leads. The variocoupler is now completed.

The panel should be drilled next. A sketch of the panel is here shown. Use a ruler in measuring each hole to be drilled so that when the set is finished it will look neat. The variable condenser should be placed in the left center of the panel, with the variocoupler in the right center, the two switches (one above the other) and the detector in the center, between the condenser and coupler. The antenna and ground binding posts go in the upper left side, and the phone binding posts in the upper right side. The .002 condenser should be used to measure the spacing of the four binding posts. The .002 phone condenser is fastened on the panel with the phone binding posts.

After the panel has been drilled, the next thing to do is to fasten the twisted taps of the coupler to the switch points. Fasten the first turn of wire on the coupler, to the first switch point of the upper switch. Commence with the switch point on the left. The first eight twisted taps go to the upper switch and the other 10 go to the lower switch. Fasten both sets of taps the same way and in the same direction. After this is finished, fasten the baseboard to the panel with four small screws. Fasten the variocoupler to the baseboard next. Be sure that enough of the rotor shaft goes through the panel so that you can fasten the dial to it. It is best to put the dial on the shaft, then fasten the coupler to the board. By doing this you can easily fasten the coupler so that the dial won't wobble when it is turned. Fasten the variable condenser to the panel next, then the detector, and binding posts. You are now ready to wire the set. Herewith is a sketch of the hook-up for this set.

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Fasten a wire to the antenna binding post and run it to the back side of the variable condenser where you fasten it to the connection of the rotor plates. Fasten another wire to the stator plate connection of the condenser and run it to the upper switch lever and fasten. Fasten another wire to the stator plate connection of the condenser and run it to the crystal side of the detector and fasten. Attach another wire to the cat-whisker side of the detector and run it to the upper phone binding post and fasten. Run another wire from the lower phone binding post to one of the flexible rotor leads of the coupler and solder it. Solder another wire to the other rotor lead and run it to the ground binding post, and from here over to the lower switch lever and fasten it. The wiring is now completed and the receiver is ready for use. A cabinet can be made for this set at a small cost and will improve the looks of it.

The best kind of antenna to use with this set is a single wire not over 100 feet long, 35 feet or more in height, with about a 35 foot or more lead-in depending on the height that it is erected.

A good ground should also be used with this set. The best kind is a five foot piece of lead or zinc pipe driven in the earth with a No. 14 wire soldered to it and run to the receiver.

The writer has received stations up to 50 miles without a ground connection to the set, and has also received stations up to 35 miles without an antenna connection to the set. So you may know that this set is very sensitive. But you *must have patience* to operate it successfully. Don't give up when you first sit down to it to tune in if you don't hear anything. It may be because there isn't any one on the air. Wait until you are sure there is someone broadcasting. Use the most sensitive unmounted galena that you can buy. The reason why the unmounted is best, is because it has six surfaces to it where the mounted only has one, and it is much cheaper, too. The writer will be glad to help any one with suggestions pertaining to this set.

Herewith is a list of stations that has been heard in two weeks time with a set of this kind. The distances are also given:

WHAZ—Troy, N. Y.	1,322	Miles
WLW—Cincinnati, Ohio	690	"
WWJ—Detroit, Mich.	730	"
WCX—Detroit, Mich.	730	"
WJAZ—Chicago, Ill.	575	"
WDAP—Chicago, Ill.	575	Miles
WLAG—Minneapolis, Minn.	517	"
WOC—Davenport, Ia.	429	"
WOAW—Omaha, Neb.	230	"
WOS—Jefferson City, Mo.	270	"
KSD—St. Louis, Mo.	385	"
WHB—Kansas City, Mo.	160	"
WDAF—Kansas City, Mo.	160	"
WMAJ—Kansas City, Mo.	160	"
WBAP—Fort Worth, Tex.	402	"
WFAA—Dallas, Tex.	402	"
KLZ—Denver, Colo.	460	"
WKY—Oklahoma City, Okla.	200	"
KWH—Los Angeles, Cal.	1,265	"
KUO—San Francisco, Cal.	1,410	"
KFBC—San Diego, Cal.	1,234	"
CHCF—Winnipeg, Can.	833	"
WGM—Atlanta, Ga.	805	"
WSB—Atlanta, Ga.	805	"
WKN—Memphis, Tenn.	460	"
WSY—Birmingham, Ala.	690	"
WHAS—Louisville, Ken.	632	"
WGF—Des Moines, Ia.	314	"
WJAQ—Topeka, Kans.	100	"

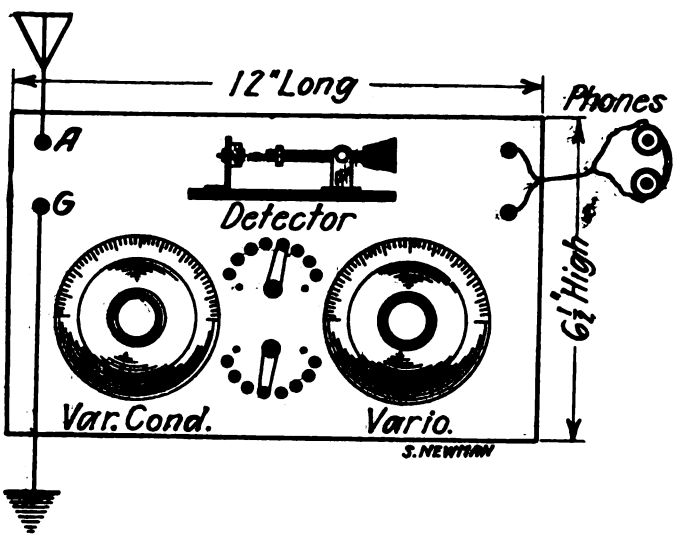

Fig. 2. Instrument layout on panel board, Wilbur's long distance sensitive crystal receiver.

I have not listed the stations under 100 miles for it would take up too much paper to write them on.

Broadcasting Pres. Harding's Speech in Texas

FORT WORTH, TEXAS.—Future possibility of carrying the human voice over a wide area during political campaigns by means of a battery of broadcast stations connected by long-distance telephone lines was demonstrated recently when Station WBAP of the Wortham-Carter Publishing Company here broadcast into thousands of Texas and southwestern homes the speech of President Harding, made 700 miles away at Station KSD, at St. Louis.

This remarkable feat was accomplished through the Fort Worth "Star-Telegram," and its success assured on account of the co-operation given by F. M. Corlett, manager of the West Gulf Division of the American Radio Relay League, and a League member at St. Louis.

As static and other atmospheric conditions would not permit the direct reception of the President's speech by listeners in the vicinity of WBAP they would have been unable to hear the address at all had it not been for the arrangement by which his words were received at the station of a St. Louis member of the American Radio Relay League, turned into a loud-speaker and finally into a long-distance connection with the Texas newspaper's radio room, where they were amplified for WBAP.

The idea of sending out through the air an address by means of several stations broadcasting simultaneously by the aid of toll telephone lines, or similar connections, has been frequently visualized by far-seeing radio men, yet never has it been attempted over so great a distance or with the same result as in this case.

According to the management of WBAP, the "Star-Telegram" local telephone exchange was jammed with long-distance calls of appreciation from enthusiastic listeners who had been informed by broadcast and through its news columns of the spectacular side of the feat.

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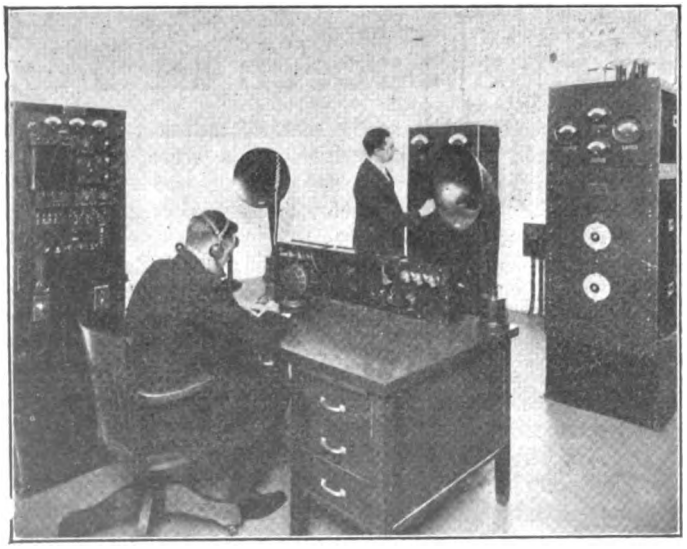
Variety Certainly Is the Spice O

(C. Kadel and Herbert)

Illustrating one of the methods recently proposed over the radio in order to gain good self-control. If you hit the fellow's nose it doesn't count and you have to do it over again until you get it perfectly. Wonder if Willie Keeler (en repose) has anything on his conscience? He surely must have faith in Phil Hughes' ability to absorb instructions over the radio.

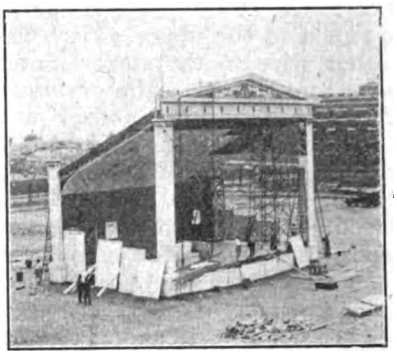
(C. Kadel and Herbert)

M. Carnido, Spanish poet, recently broadcast his poems through the Eiffel Tower broadcasting station in Paris, France. Note the immense microphone that is used by the French people. Quite different from the small, innocent-looking "tin-cans" or diaphones used over here. The illustration shows M. Carnido before the "unseen voice of the air."



(C. Western Electric)

The operating and control room of Station WSAI of the United States Playing Card Co., Cincinnati, Ohio. Standard Western Electric apparatus is used. The panel on the left is the speech amplifier control board and the two boards in front of the operator contain the power control apparatus and the tuning apparatus and tubes. Note the receivers in front of the operator by which he can determine how the signals are going out by utilizing a separate receiver.



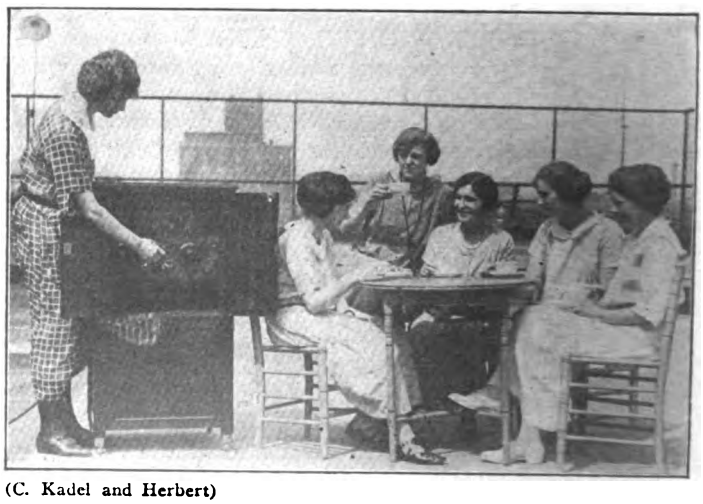
(C. Kadel and Herbert)

The orchestra stand being built at the City College stadium, where the New York Philharmonic Orchestra will open its season and broadcast through station WJZ. This is one of the largest structures of its kind and will cost $15,000. Special attention to acoustics suitable for radio has been paid in its construction.

Captions
Robert
Dougher

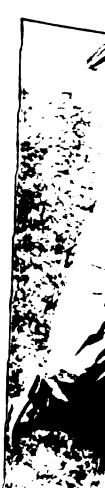
I'LL GIVE MY NEW RADIO-SET A GOOD TRY-OUT TO-NIGHT
THE OPENING CONCER WILL BE A SEXTETTE FROM "THE ST ROBBER OF HOBOKEN"
BARON O'BROKE WILL RECITE "A DIME IS ONLY TWO NICKELS" ASS-ISTED BY MME. COLDSLAUGH
SHOWS OVER- DON'T FORGET TO DO YOUR SUNDAY SHOPPING - ITS SATURDAY NIGHT TO-NIGHT

Underdonk Kedonk is suddenly reminded t
on Sunday—thanks to Station



(C. Kadel and Herbert)

The Young Women's Christian Association headquarters at 610 Lexington Avenue, New York City, has installed a complete portable radio receiver on the roof of the building and when the girls go up for afternoon tea, or sit out in the warm eve ngs, they are entertained by means of this receiver. The illustrat s them listening in to a Sunday musicale.



(C. International Ne

Members of the 101st at Peekskill, listening out. The members which [illegible]

# of Life In Radio News Pictures

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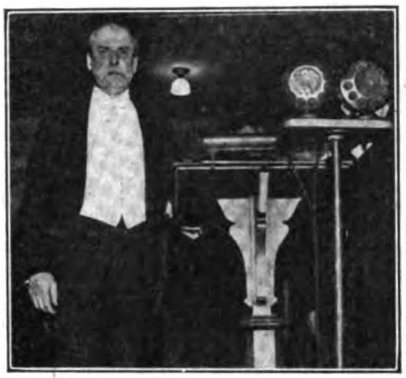


(C. Kadel and Herbert)

Secretary of State Hughes, who recently made his plea for a World Court via radio from Columbia University, New York City. The speech was broadcast through WEAF and heard throughout the greater part of the United States.

ONCERT
TETTE
ROBBERS
MADAME DE EAT WILL NOW SING "YOU CANT TELL HOW OLD A CABBAGE IS BY LOOKING AT IT"
OVER- DONT DO YOUR PPING - ITS NIGHT TO-
GOING T' CLOSE RIGHT AWAY
GIVE ME $2 WORTH OF HAMBURGER!
B S. Rankey '27

reminded that he will be hungry
to Station WOP.

(C. International Newsreel)

Members of the 101st Signal Battalion, New York National Guard, in camp at Peekskill, listening to broadcasting by means of a French army field set. The members of the battalion are given a thorough course in radio which has supplanted field telegraph and telephone to a great extent in the army because of its portability and ease of control.

(C. Kadel and Herbert)

Ivan Andre, well-known artist of England and France, finds that radio concerts are a great aid to his inspiration. At present he is in this country, executing a number of miniatures and landscapes. His only hobby outside of painting is radio and his portable set is always with him. It is a three-tube reflex using U.V.199 tubes with a small loop antenna. One is reminded that there is no accounting for the tastes and idiosyncrasies of temperamental people like artists and musicians. When we catch an office boy whistling shrilly and doing a piece of work at the same time we are prone to think that his temporarily divided mentality isn't especially good for the work—but he may whistle fine. The right program received by radio doubtless is soothing.

(C. International Newsreel)

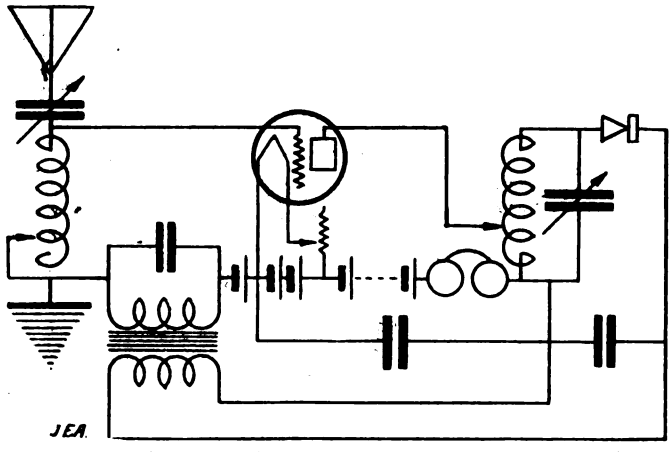
The English Parliament recently were Signor Marconi's guests at a demonstration which took place at the Chelmsford and Ongar wireless stations in England. This is an unusual photograph of Marconi, inasmuch as it shows him with a head set on. On the left is Godfrey Isaacs, M.P., and on the right is Gratton Doyle, M.P., taking great pleasure in listening in on Marconi's portable receiver located in the limousine.

A Simple and Satisfactory Regenerative Reflex Receiver

By J. E. Anderson, M. A.

SIMPLICITY of control is one of the main characteristics of a reflex receiver. In many of the circuits there is but one variable while in others there are only two. None of these simple circuits is regenerative, and for this reason they are neither as selective as they might be nor is the volume of output as large. It is ordinarily believed that if they are made regenerative they become too difficult to manipulate; but this is not necessarily so. By the sacrifice of a little simplicity a reflex circuit may be made regenerative, and the regeneration may be held under perfect control. Only one or two additional controls are necessary.

The writer has tried out numerous reflex regenerative circuits with a view of finding a simple and satisfactory combination. The trouble encountered was not in finding good circuits but in selecting the best out of the many good circuits tried. Many of them seemed equally good, some excelling in sensitivity, some in selectivity, and others in simplicity of control. The



Anderson's simple and satisfactory regenerative reflex receiver hook-up.

circuit shown in the accompanying diagram seemed best to meet the requirements.

This is a single circuit tuner, single tube reflex that is made regenerative by varying the inductance, or more accurately the reactance, in the plate circuit. It may be operated in three different ways. In the first place, as a simple regenerative receiver, in the second as a simple reflex, and in the third as a regenerative reflex. If it is desired to use it as a simple regenerative circuit all that is necessary is to lift the catwhisker from the crystal and tune the plate until the proper amount of reaction is secured. When it is used in this manner the circuit is extremely selective. If it is desired to use the circuit as a simple reflex the catwhisker is adjusted for maximum sensitivity and the secondary of the plate auto-transformer is tuned to the desired frequency. The portion of the coil that is included in the plate circuit is then adjusted to a value such that the circuit will not oscillate. For short wave lengths only a few turns are necessary, while for the longer broadcasting wave lengths the entire coil may be required. If it is desired to use the circuit as a regenerative reflex the secondary of the auto-transformer is tuned accurately to the frequency desired. Then the plate inductance is increased until the circuit will oscillate, when a slight detuning of the condenser will just stop the oscillations and bring the signals to the desired intensity, or to the maximum intensity obtainable. If the circuit will not oscillate, the inductance in the grid circuit is also increased, and the plate variables readjusted. It may be necessary to change all the four variables at the same time; that is, the two variable condensers and the two variable coils, in order to get best results. Usually a very large value of inductance is needed in the grid circuit and a comparatively small value in the plate circuit.

The inductance coil in the grid circuit should not be less than 75 turns on a 3.5 inch tube or the equivalent. This should be capable of variation in steps of two to five turns. The condenser in the antenna circuit should not be larger than .0005 mfd. A .00025 mfd. condenser would be preferable if it is available. The inductance in the plate circuit coil should be about 60 turns on a 3.5 inch tube, or its equivalent, and this should be tapped every five turns. The condenser across this coil may be one of .0005 mfd.

The by-pass condenser in the primary of the audio-frequency transformer may be omitted if desired. If it is used it should not be larger than .001 mfd., because it directly affects the tuning of the plate circuit. The by-pass condenser in the secondary of the transformer may also be omitted as the safe-capacity of the leads is about sufficient. However, if it is used, it should not be larger than .0005 mfd. Both of these by-pass condensers, if too large, will also by-pass the high audio-frequencies to an appreciable extent. The effect is a general lowering of the tone of music and speech. If the signals are too shrill, that is, if the high audio-frequencies are too pronounced, these condensers may be used to reduce the distortion and render signals of a more pleasing tone.

Sometimes it is not possible to cause the tube to oscillate, especially for the higher broadcasting wave lengths, even if large inductances are used both in the plate and the grid circuits. Some tubes oscillate much more rapidly than others, due to greater inter-electrode capacities. When the tube will not oscillate because these capacities are too small, it is necessary to introduce additional reactance between the plate and the grid circuits. This may take any of the customary forms used to secure regeneration, but it does not need to be variable unless desired, as sufficient variation can be secured in the two variable coils or the two condensers.

Just a few words will be said about the performance of this circuit. It was first tried out during a time when the local broadcasting stations were silent. But the traffic in the ether was really heavy. Many medium distance stations were brought in, and a surprisingly large number of small local stations were "discovered." But since most of these stations had never been heard before on that antenna, it was not much of a test of the circuit. However, when WOR opened up it was no longer necessary to wear the head phones; for the signals were so loud that they could be heard all over the room. It was more than the little dry cell tube used could carry, and consequently the quality of the signals was very bad.

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Latest Radio Patents

Receiving System for Electric Waves

No. 1,457,009: Patented May 29, 1923. Patentee: Lucien Levy, Paris, France.

In the specification of patent application Serial No. 249,572 filed August 12, 1818, the applicant has described a system of electric transmission at a distance, applicable to wireless telegraphy and telephony and comprising a special transmitting station device and a special receiving station device.

In this patent it was specified that this receiving station device could be combined with a local generator permitting it to receive the ordinary emissions of the continuous wave stations under sufficient conditions of selectivity in spite of the disturbances of spark stations or atmospheric parasites.

Fig. 1.

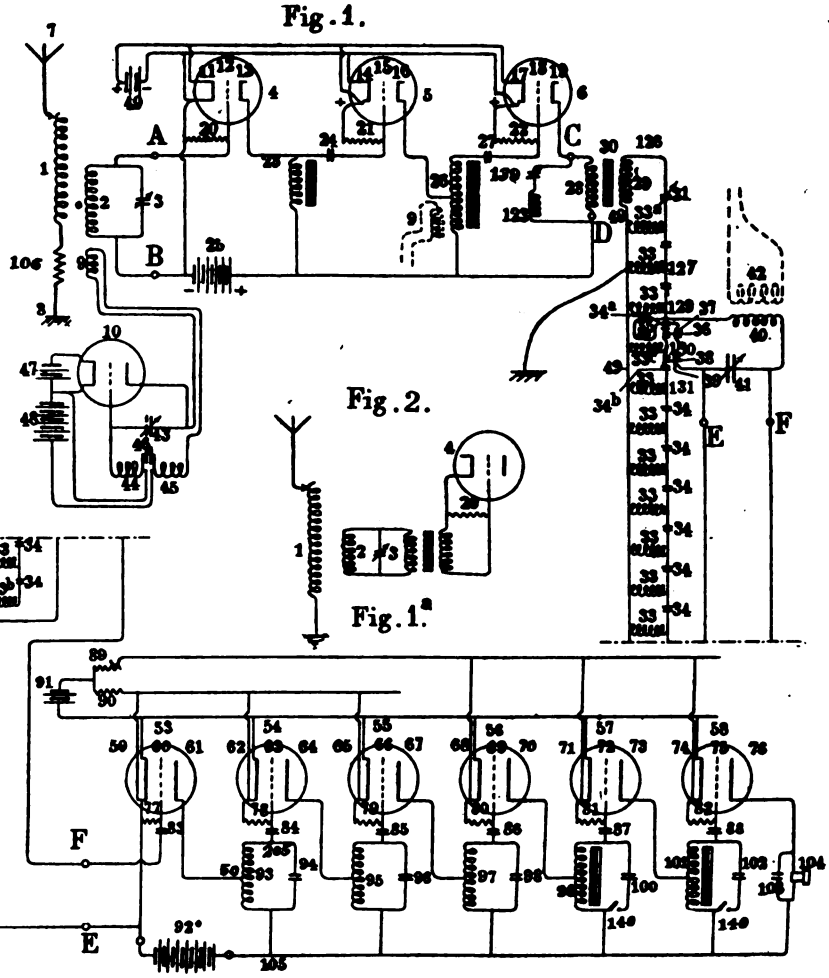


Fig. 2.

Fig. 1a.

Circuit diagrams of Levy's improved system for receiving electric waves.

The present application has for its object an improvement made in the receiving system described in the original application of the applicant in the case of its application to waves emitted by ordinary stations, for the purpose of obtaining a more complete selectivity and a greater protection against atmospheric parasites.

These improvements consist in:

1. A special method of secondary selection based on the original principle described and comprising also various complementary operations intended to ensure efficient working of the system in all cases, even when the parasitic disturbances or confusion are very intense.

2. Arrangements which permit of the practical carrying out of the improved method and ensuring very great sensitiveness of the system.

The present improved method comprises, broadly, the following operations consisting:

1. In producing in the primary detecting selector circuits, before the first detection, beats of adjustable amplitude and of adjustable ultra-acoustic frequency (of the order for example of 10,000 per second) between the currents induced in the circuits by the oscillations of the receiving antenna and the current which is induced by a local generator of high frequency.

2. In amplifying and then detecting these beats in a detecting amplifier of high frequency.

3. In separating the numerous periods of current of ultra-acoustic frequency furnished by the detection of the beats of the continuous wave, from some periods of limited amplitude and very small in number, (one or two furnished by parasites) and from the currents of low frequency coming from the succession of the parasites: this selection taking place in a secondary selector the working of which, is based generally on the known phenomena of propagation of electric waves of systems with capacities and self inductors distributed in a relatively small number of elements.

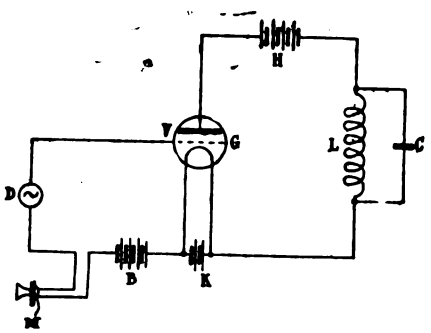
4. In amplifying the selected currents of ultra-acoustic frequency and in transforming them into current of acoustic frequency by causing them to beat with a local current of ultra-acoustic frequency and then in detecting the beats obtained.

5. In effecting a selection on the acoustic frequency.

Modulated Wireless Signaling System

No. 1,455,849: Patented May 22, 1923. Patentee Norman Lee, London, England.

This invention relates to modulated electric signaling systems and particularly to wireless signaling systems.



Lee's modulated wireless signaling system.

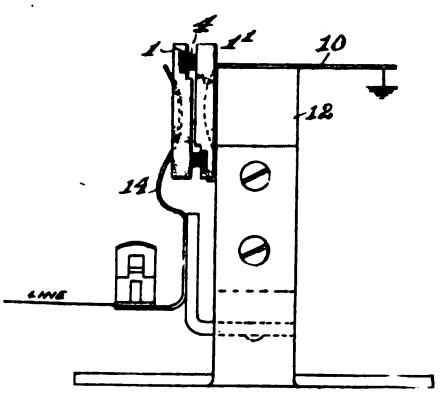
The principal object of the invention is to provide an amplifying appliance wherein the high frequency output of an amplifying power valve energized by a suitable source of oscillating current is modulated by causing the separately produced modulating potentials to vary the potential of the grid of the power valve about a certain negative value and thus to vary the high frequency output of the valve.

Electrical Protector

No. 1,457,249: Patented May 29, 1923. Patentees: G. W. Janson, Brooklyn, N. Y., and L. H. Rovere, Richmond, N. Y.

This invention relates to protective devices for electric circuits, commonly referred to as lightning arresters.

The purpose of the present invention is to provide an arrester in which the air-gap is very accurately determined and definitely maintained and wherein no mica or other separators are interposed between the arcing surfaces so that an inspector can readily detect any attempt to alter the thickness of the air-gap. We furthermore provide for a direct positive contact between the electrodes whenever the arcing continues beyond a predetermined interval, thus avoiding the expense of providing fusible inserts as well as any uncertainty which may be occasioned by relying upon a connection of fusible metal.



Janson's improved device for protecting electric circuits.

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Answers to Readers of Radio World

Is amplification without tubes possible? Is it practical? Is any firm making instruments of that sort?—Joseph Shannon, 702 Seventh Avenue, New York City.

Amplification is possible by the use of magnetic amplifiers, utilizing the microphonic vibration principle. They are not practical because of the harsh sounds that they make. No firms that we know of make instruments of this sort. There is no market for such apparatus, as the present tube amplifiers are much more efficient.

* * *

What set would you consider best for one using not more than three tubes? Will the 22-turn coil and 43-plate condenser used in the antenna circuit of Mr. Shult's set, described in RADIO WORLD *for February 17, be of any value in other circuits? Can a .001 variable condenser with vernier be used in place of an .0005 variable condenser? Will connecting four .001 fixed condensers and one .001 variable condenser in parallel as per enclosed sketch give me a useful capacity of .005?—Jesse I. Seward, 1 Clinton Street, Palmyra, N. Y.*

Would suggest that you use a three-tube reflex circuit, such as the D7 Reflex, using a crystal as a detector. This will allow you to get the most out of three tubes if you take extreme care in the construction and use the best apparatus. You can use the coil and condenser you mention in other circuits that call for a coil of this size. The condenser can be used in any circuit. You can use a .001 variable vernier in a circuit that calls for a .0005 by using half of its capacity. The arrangement of condensers that you suggest would allow you to get a useful capacity of .005.

* * *

In RADIO WORLD *for April 14 you published a circuit by Arthur S. Gordon. I have constructed this circuit and have had good results when I use the detector, but when the amplifier is plugged in the set seemingly goes dead. I have checked the diagram with my set and find that it is absolutely correct. What can my trouble be and how can I remedy it?—William Oakes Morris, 197 So. Whitney Street, Hartford, Conn.*

Suggest you test your amplifying transformers. It is quite evident that, as you have tested out your circuit and found it absolutely correct, one of the windings must be blown. Test each one out independently by means of a dry cell and a pair of phones. If you do not hear a click when the circuit is made and broken you will know that you have a burnt-out winding, or that one of the windings is damaged in some manner.

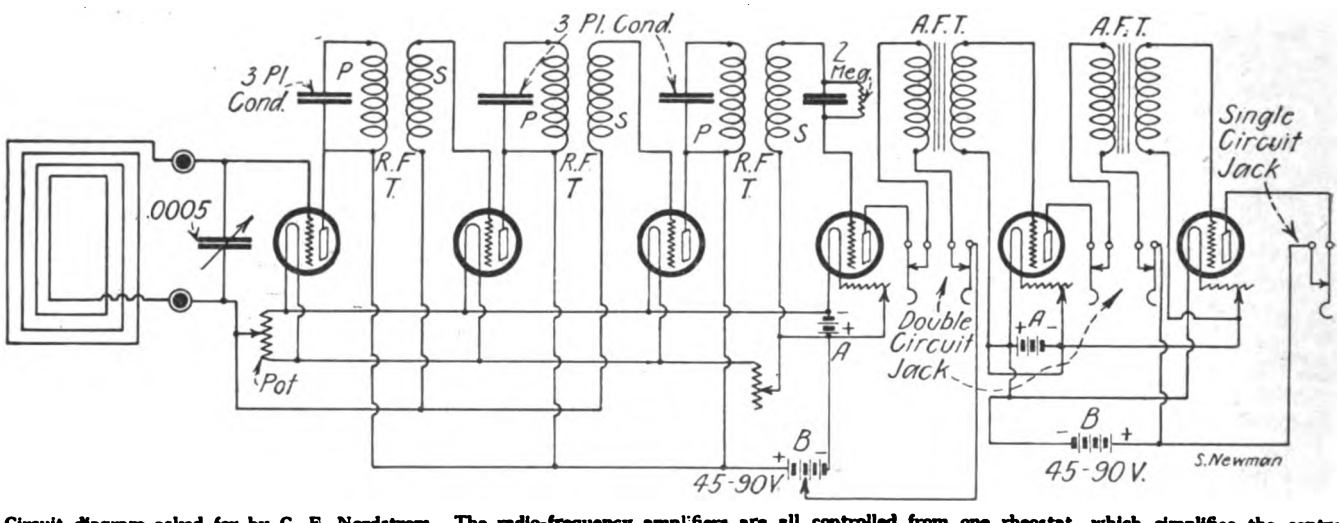
* * *

I intend building a portable set to take away to camp with me. Is it possible to use the flashlight cells to light a six-volt tube if I use six cells, three in series and three in parallel?—Jacob Winslow, 374 Elm Street, Boston, Mass.

You should be able to light your tube by the use of the cells you mention, but you have the wrong idea in regard to the connections. You should hook up two sets of three in series and put them in parallel with each other.

* * *

Kindly publish a circuit diagram of a three-stage radio-frequency, detector, and two-stage audio-frequency set, with a loop antenna and separate rheostat for each tube in the audio-frequency tubes and 3 plate condensers across the radio-frequency transformers.—C. E. Nordstrom, 3224 18th avenue, South, Minneapolis, Minn.



Circuit diagram asked for by C. E. Nordstrom. The radio-frequency amplifiers are all controlled from one rheostat, which simplifies the controls considerably. Separate A and B batteries are furnished for the audio-frequency and radio-frequency tubes to prevent any chance of trouble due to radio-frequency currents leaking through to the audio-frequency tubes. This is the best method of procedure in a set of this type. Tuning is done by means of the condenser shunting the loop.

The circuit you wish is published herewith. It is necessary when constructing a circuit of this type to keep your leads separated and the battery leads apart. Two sets of batteries are furnished for both the radio-frequency and audio-frequency circuits to prevent any trouble due to leakage from one circuit to another. A coupler is not necessary when a loop is used.

* * *

I noticed the term "phantom circuit" used in connection with the measurements of various circuits in experimental work. What does the expression signify?—Robert Mackay, Box 14, Sheepshead Bay, L. I.

In laboratory experiments it is not advisable to use regular antenna and ground circuits in conducting all kinds of work; therefore resistances and inductances are used which measure exactly the same as would the regulation antenna and ground system. Experiments are conducted in this manner. Thus one is able to find out how different experiments work out without actually using the regulation system. When they are working in this manner they are using "phantom circuits."

In a paper recently presented before our local radio club one of the talkers made mention of the fact that the windings on a coupler of a radio set should be made with the same size wire on both primary and secondary. I have made a coupler, but have used 20 DCC wire on the primary and 24 SCC on the secondary. Should I rewind it? Will it give me better results?—Lawrence Houston, Palm Cottage No. 6, Florida.

The common method of procedure is to wind the same size wire on both the primary and secondary of the couplers, but it will not detract from your set by having different size wire on both windings.

* * *

I recently built the circuit described by George W. May in RADIO WORLD *for Feb. 17 and have had wonderful results. Can I turn this receiver into a reflex set? If so, will you please give me a diagram and constructional data for doing it.—Edward Walter, 5624 Locust Ave., Kansas City, Mo.*

You can use some of the apparatus for a reflex circuit, but turning the same circuit into a reflex is impossible. We refer you to RADIO WORLD for Feb. 24 and March 3 for reflex circuits.

* * *

Is it possible to utilize a battery charger for filament current without using a storage battery? How will I connect it?—Harry Gilbourne, Yard Street, Freehold, N. J.

You cannot do what you mention. You would blow your tubes. A battery charger is not meant for that kind of work. It is designed for charging storage batteries alone, and cannot be used for anything else. The use of any rectifier feeding directly from alternating current would produce a very disagreeable hum in your tubes.

* * *

I am desirous of building a radio-receiving set that will enable me to clearly get long-distance stations. What is the most advisable circuit to use that will allow me to accomplish this?—Dr. B. Kahn, First National Bank Building, Winters, Texas.

We would advise the use of a reflex circuit for the purpose you name, with radio-frequency, detector and audio-frequency set as a second choice. Numerous circuits of both these types have appeared in back numbers of RADIO WORLD.

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Origin of the SOS Call

By Jack Binns

WHAT do the letters SOS used by ships at sea as a distress call stand for? That is the question which I have been asked a thousand times, says Jack Binns in the New York *Tribune*. The answer to it is simple enough, but in view of the general aptitude to assign a catch phrase to any arbitrary group of letters, a simple answer will not suffice the average person. In this case the letters are associated with the cry "Save our souls!" so far as the public is concerned, while the call CQD, which it superseded, meant "Come quick, danger!" to the layman.

As a matter of cold fact, neither of these two phrases is correct. Unfortunately, it is the truth that both groups of letters were adopted as a matter of expediency and not because of their peculiar susceptibility to dramatic interpretation. The original CQD was arrived at by the ordinary process of evolution in the detail work of communication, while SOS was an arbitrary adoption of the first international radio telegraph convention.

The story of the distress call has never been adequately told, and in view of the large number of questions that have been raised on the point I am going to outline in this article the history of the famous calls.

When wireless telegraphy was first placed into commercial use the ordinary telegraph and cable systems had been in operation several years and had reached a high state of development. The operation of the latter systems was governed by an international convention which periodically laid down rules to meet necessary operating requirements.

Among these rules was a series of double letter symbols which were used by operators to facilitate the working of special circuits, and these symbols invariably incorporated the letter Q because it is one of the least used letters in the alphabet, and in the Continental code its dots and dashes are distinctive. In these various groups there was the signal CQ. This was used on telegraph lines where more than one station was on the line, and it meant that the operator sending the call wanted every station along the line to listen in to what he was about to say.

Now most of these operating symbols were adopted by Marconi's new company when it began commercial operation at sea in the year 1902. The call CQ particularly adapted itself to wireless use, because any ship hearing the call would answer and thus establish communication with the ship making the call.

As the system gradually developed there were a number of minor emergency calls made and it was quickly observed that the call CQ was not of sufficient distinction for emergency purposes. As a result of these experiences the following general order, known as "Circular No. 57," was issued by the Marconi company on January 7, 1904:

"It has been brought to our notice that the call 'CQ' (all stations), while being satisfactory for general purposes, does not sufficiently express the urgency required in a signal of distress.

"Therefore, on and after February 1, 1904, the call to be given by ships in distress or in any way requiring assistance, shall be 'CQD.'

"This signal must on no account be used except by order of the captain of the ship in distress, or other vessels or stations transmitting the signal on account of the ship in distress.

"All stations must recognize the urgency of this call and make every effort to establish satisfactory communication with the least possible delay.

"Any misuse of the call will result in instant dismissal of the person improperly employing it."

This is the exact wording of the famous general order as issued. The original is now framed, and exhibited as part of the important archives of the Marconi company. It was superseded in July, 1908, by the adoption of the call SOS as a distress signal by the International Radio-Telegraphic Convention, which sat in Berlin. As this convention was not completely ratified by all of the nations represented for at least a year, the call CQD remained in force sufficiently long enough to be used in the first major sea disaster where wireless played an important part.

The call SOS is purely arbitrary in its grouping of letters and was chosen because of the unusual combination of dots and dashes which make it distinctive above all other calls. It consists of three dots, space, three dashes, space and three more dots.

Do You Remember When—

A receiver consisted of a coherer and you used to hold your breath when it clicked?

You first made your tuning coil, laboriously winding a rolling pin with wire, connected it to a galena or carborundum detector, and then tuned for Navy, and boasted about it for a week?

You used to try and copy some of the crack operators in the Navy and you covered sixteen sheets with two letters, a word, and then finally a whole sentence?

You first heard a signal over another fellows "audion?" And then for nights you used to lay awake and plan ways of making enough money to get one?

You used to copy Arlington press and weather and pride yourself on the fact that you never missed a word?

You got so used to hearing the weather report that you could tell what was coming and write it down before it was sent?

You blew out your first tube?

You went down to the Navy yard for your license? Gosh, but a radio officer can make you nervous!

The Farmer Informs the City Feller

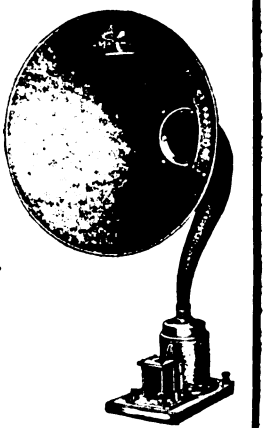
A PARTY of city dwellers, returning from an automobile trip into the Adirondacks the evening of July 4 began to discuss the Shelby financial fiasco. It was after 8 o'clock and they were naturally curious about the outcome of the fight. Passing a farm house, one of the men in the party saw a radio antenna running from dwelling to barn and he suggested that they ask the farmer for the latest news on the fight.

The farmer was caught as he came in from the barn. He calmly heard their question as though it was the most natural thing in the world that he should be asked the outcome of a fight in Shelby, Montana.

"Dempsey won on points," the farmer laconically answered.

The radio story of the fight, broadcast by WGY at Schenectady, N. Y., gave the farmer the news as quickly as it arrived in the offices of great metropolitan newspapers.

MAGNAVOX
Radio Products



R2 Magnavox Radio The Reproducer Supreme

The Utmost in Sound Amplification

Where the reproduction of broadcasted programs is desired in large volume, the Magnavox Reproducer R2 should be used.

Thanks to the Magnavox (electro-dynamic) principle of construction, this result is secured with minimum electrical energy.

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . $90.00

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field $60.00

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . $35.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

Magnavox Radio products can be had of good dealers everywhere. Write for copy of our new booklet.

The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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THE RADIO BUSINESS IS GETTING INTO FINE SHAPE. AS FORBES SAYS: "THE BEST STEEL IS THAT WHICH HAS UNDERGONE THE HARDEST POUNDING."

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Bryant 4796

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Watford Slee, W714 Shannon Ave., Spokane, Wash.

Harry Dufout, 111 South Water St., East Port Chester, Ct.

John Rohlig, 119 Gladstone Ave., Windsor, Ontario, Canada. (In market for radio supplies).

Wm. Norman Kearney 2918 North 6th St., Philadelphia, Pa. (Retailer. Makes up sets to order).

The Sterling-Miles Radio Co., 288 Judson St., Pontiac, Mich. (Retailers).

George Fisher, 129 States Ave., Atlantic City, N. J.

F. L. Bartlett, 944 Sherman St., Denver, Colo. (In market for radio equipment, especially high grade sets).

Walter Klyce 1254 Lamar Blvd., Memphis, Tenn. (Wants to become a distributor of radio sets and parts).

Q S A Radio Club, care Michael L. Tortariello, 154 Ridge St., Newark, N. J.

E. B. Gray, Livingston, Tenn.

E. O. Drumgoole, Zachary, La. (Wants reliable radio parts).

J. A. Schmitt, 355 Wilkins St., Rochester, N. Y.

W. P. Harper, 360 Juan Manuel St., Guadalajara, Mexico. (Retailer. In market for radio telephone transmitter equipment of 50 and 100 watts output).

Wm. A. Greer, Aledo, Ill. (Rebuilds and overhauls radio sets. Retails parts).

W. Hall Moss, "Anything Electrical," Dayton, Tenn. (Dealer. Requests discounts.)

E. L. Harris, 2536 Harriet Ave., Minneapolis, Minn.

W. A. McKay. 5092A Easton Ave., St. Louis, Mo. (Wants No. 18 S. C. C. copper wire in small quantities.)

Thomas McNulty, 7249 Rhodes Ave., Chicago, Ill. (Requests dealers' discount.)

QST Radio Club, Daniel Crecca, Secretary, 38 Berkely Ave., Newark, N. J.

G. B. Sherwood, 610 Third Ave., Johnsonburg, Pa.

Norman A. Krebs, 317 Cherry St., West Homestead, Pa.

Irvin F. Marutz, P. O. Box 57, Freelandville, Ind.

Hardy G. Meissner, Kerrville, Texas.

Doyle Frampton, Route 1, Tyman, Miss.

R. Burchard Lawrence, 507 South Main St., Taylor, Pa.

G. R. Warren, 1548 Seventeenth St., Santa Monica, Cal.

$3,000,000 Radio Purchase

GIMBEL BROTHERS, of New York City, it was announced last week, have closed a deal with the Radio Corporation of America for the purchase of 20,000 Radiola R. C. receiving sets, manufactured by the Westinghouse Electric & Manufacturing Co., over 60,000 of which are now in use in the United States. The purchase price was not divulged, but it was reported that the value of the merchandise, at present nationally established list prices, is about $3,000,000.

Station WOR Awards Prize to Dr. Gildersleeve

STATION WOR, owned and operated by L. Bamberger & Co., Newark, N. J., recently offered a prize for the photograph showing the best and most decorative arrangement of a radio receiving set in the home. Many amateurs entered the contest, some of them submitting three and four photographs. The prize, which is a hand-colored enlargement of the winning photograph, has been awarded to Dr. Donald M. Gildersleeve, 169 Prospect Park West, Brooklyn, N. Y., for the picture of his set used as an illustration on page 13 of RADIO WORLD for July 21, 1923.

A Fixed Crystal Detector

THE Grewol detector, distributed by the Randel Wireless Company, Newark, N. J., takes the crystal detector out of the group of adjusting instruments, which the fan has to learn to operate. It performs all the duties of a detector, but requires no more attention than a fixed condenser. The Grewol detector comes to the consumer already set and fixed so that the adjustment is vibration and jar-proof. At the factory the most sensitive spot on the crystal surface is found, and the cat-whisker is secured so as to stay exactly on this spot. A glass cover fits snugly to keep out moisture and dust. This detector on a set can be forgotten. The makers claim that it will continue always to be as sensitive as the day it was purchased because the adjustment cannot be "lost."

De Forest Company Again in the Courts

PAPERS were served on July 17 on the DeForest Radio Telephone and Telegraph Company, of Jersey City, N. J., in a suit brought by the Wholesale Radio Equipment Company of Newark, N. J.. The plaintiff wants $125,000 for breach of contract, alleging that on Oct. 6 last it signed a contract with the DeForest company by which the plaintiff company was to handle the defendant company's products for two years.

The DeForest company recently notified the Newark concern that the contract would be canceled on June 23. The plaintiff company had $7,500 worth of the defendant company's products on hand, it said, the value of which was depreciated by the sale of the defendant company's products by the defendant company to other agents in the same territory at a lower price.

Radio Trade Notes

W. L. Armitage, 647 Yonge St., Toronto, Ontario, Canada, would like exclusive agencies for Canada.

* * *

Yale Radio Electric Co., 4816 South Vermont Ave., Los Angeles, Cal., offer aggressive representation for radio goods in their territory.

* * *

A. M. Connell, 564 Washington St., Boston, Mass., desires one line or several small lines of radio merchandise.

* * *

The Northwestern Electric Equipment Company, 174 East Sixth St., St. Paul, Minn., will hereafter confine their efforts to the wholesale distribution of electrical, radio and telephone supplies.

* * *

The Blue Ridge Electric Company, 709 National Bank Bldg., Charlottesville, Va., has been organized to act as manufacturers' agent for electrical appliances and supplies.

Every City Should Have Its Broadcasting Plant

SOME months ago there appeared in RADIO WORLD an article about the new broadcasting station to be built and operated by the City of New York. This article attracted a great deal of attention.

RADIO WORLD is now starting a campaign for the purpose of interesting the city fathers of all the good-sized American municipalities in a plan by which each city shall have a municipal broadcasting staton of its own. In this way the message of radio will reach the homes of millions of Americans who are not now owners of radio sets, and in the near future should lead to millions of new sales of radio sets that would not otherwise be made.

RADIO WORLD is getting in touch with the city authorities in thousands of towns throughout the country in the effort to make known its plan, which is a most comprehensive one and shows how it can be operated for the benefit of present local radio fans and fans-to-be.

By the way, a nominee of either party who would come out on a platform, one of the planks of which would be "Our city should have its own municipally operated broadcasting station," undoubtedly would be a popular candidate among local voters.

The more municipal broadcasting stations that are organized throughout the country on the order of New York City's broadcasting station, the better it will be for all owners, manufacturers, distributors, dealers, and the art, science and business of radio generally.

THE EDITOR.

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Daily Newspapers Publishing Radio News and Programs

AS a part of its service to readers RADIO WORLD publishes herewith the names of daily newspapers which carry radio programs and radio news. Wherever possible the name of the radio editor of the paper is given. Additions to the list will be published as received.

Oakland Tribune, Oakland, California. Publishes radio programs. Radio editor, Seth T. Bailey. Operates Radio Club of the Oakland Tribune, Station KLX.

The Chicago Tribune, Chicago, Ill. Lists Chicago stations somewhat fully and gives the program hour of about 20 outside stations, making mention of "specials." Elmer Douglass, radio editor.

The Sun, Baltimore, Md. Carries radio programs in morning, evening and Sunday issues. Frank Chapman, radio editor.

Illinois State Journal, Springfield, Ill. Carries daily radio department, which includes the programs of broadcasters throughout the country. S. Leigh Call, editor.

The Birmingham News, Birmingham, Ala. Publishes daily programs of its local broadcasting station, WSY. Sunday department sketches programs for the coming week of large broadcasters. Jack Turner, radio editor.

The Boston Post, Boston, Mass., publishes very complete programs and devotes from one to two pages to radio daily and Sunday. Lewis S. Whitcomb, radio news editor. Prof. Henry Bayard Phillips, technical editor.

Waiting for the Stinger

HE was running a small hardware store in a newly developed district, and the wholesale dealers found him backward in payment of his accounts. They sent him letter after letter, all of them polite, but each more threatening than the last. Finally they sent their representative down to give him a sporting chance.

"Now," said the caller, "we must have a settlement. Why haven't you sent us anything? Are things going badly?"

"No, everything's going fine. My bankers will guarantee me all right."

"Then why haven't you paid up?"

"Well, you see, those threatening letters of yours were so well gotten up that I've been copying them and sending them out to some customers of mine who won't pay up, and I've collected nearly all outstanding debts. I was only holding back because I felt sure there must be a final letter, and I wanted to get the series complete."—Forbes Magazine.

Thanks for the Appreciation!

EDITOR, RADIO WORLD: I take this opportunity to express my gratification with such a high-grade radio publication as RADIO WORLD and for the good it is doing the radio business.

Very truly yours,
THOMAS McNULTY.

7249 Rhodes Ave.,
Chicago, Ill.

Are You Coming to New York?

ARE you an out-of-town radio dealer or manager of a radio department for one of the big stores? And are you coming to New York in the near future? If so communicate with us and, we believe, it will be to your advantage. Address Business Manager, RADIO WORLD, 1493 Broadway, New York City.

Western Union's Revenue for Past Six Months

THE Western Union Telegraph Company, for the first six months of 1923, reports gross revenue, including dividends and interest received, of $56,097,327, comparing with $50,603,181 in the same period last year. Total operating expenses, including charges for repair and reserves for depreciation, aggregated $48,141,299 against $43,856,579 in 1922, leaving a balance, after all expenses, of $7,956,028 against $6,746,602. After deduction of interest charges on bonded debt there remained net income available for the capital stock of $6,802,603 against $5,593,177 in 1922.

E. Y. Gallaher, vice-president and controller, in his statement, says that the expenses for the first half of 1923 include charges for accrued proportion of employes' income participation, whereas no corresponding charges were incurred for the same period of 1922.

Mr. Kullman Is a Great Radio Enthusiast

P. C. KULLMAN & CO., New York City, "the wireless brokerage house," is sending out the fifth of a series of circulars designed to "put radio on the map of the world." This latest piece of constructive propaganda has been mailed to officials in charge of wireless telegraphy and radio telephony in 112 foreign countries. It gives interesting information of radio development in the United States, including the following statistics:

UNITED STATES

Trans-Oceanic Stations	12
Experimental Stations	292
Broadcasting Stations	591
Point-to-Point Commercial Stations	128
General Public Service Stations	41
Aeroplane Stations	2
Technical Training School Stations	128
Amateur (Licensed) Stations	18,357
Limited Public Point-to-Point Stations	40
Ship Stations (Estimated)	3,000
Amateur (Unlicensed) Stations (Estimated)	3,500,000

New Radio and Electric Firms

Barnes & Corry Radio Co., 1502 Commerce St., Dallas, Tex.

Smith Porter Elec. & Radio Co., Pawnee, Oklahoma.

Brockaway Radio Corp., Geo. H. Stevens, 234 Temple St., Boston, Mass.

Federal Radio Co., 19th and Harney Streets, Omaha, Neb.

King Electric Co., 221 W. 2d St., Los Angeles, Cal.

Sterling Electric Co., Bedford and Centre Streets, Cumberland, Md.

J. F. Ambros Co., 1107 Fifth St., Miami Beach, Fla.

R. V. English Electrical Co., 226 Gold Street, Buffalo, N. Y.

Jones-Cornett Electric Co., Welch, W. Va.

Lewis-Neal Electrical Co., Danville, N. Y.

West Side Electrical Co., 116 Charlestown Street, Charlestown, W. Va.

Fox Hardware Co., New York City, 200 shares preferred stock, $100 each; 300 common, no par value, active capital $21,500; H. L. Rashbaum, I. J. Feldman, B. Weiner. (Attorney, B. Chess, 302 Broadway.)

Mu-tron Radio Corp., install radio, $250,000; Geo. A. Blackford, Wheeling, W. Va.; A. Tegarden, Martin's Ferry, Ohio; T. M. Darrah, Wheeling, W. Va. (Horace G. Eastburn, Wilmington, Del.)

Harlem Radio, $5,000; H. C. Bernheim, M. Lovett. (Attorney, M. L. Gilman, 27 Cedar St., New York City.)

Associated Manufacturers Of Electrical Supplies Hold Annual Convention

THE annual convention of the Associated Manufacturers of Electrical Supplies was held at the Hotel Griswold in New London, Conn., recently, with a large membership in attendance.

This association is a representative of the engineers and executives of the leading electrical industries of the United States, an organization which in the versatility of its aims and objects as well as membership exceeds any of its kind in the country.

With the expansion of the radio industry, a section of the society was formed by radio manufacturers. The chief objects of the Radio Section are to further the simplification and standardization of radio apparatus, to develop among the radio manufacturers more efficient manufacturing processes, and to establish a centralized bureau for the dissemination of unbiased radio information, whether news or technical, for universal press consumption.

Up to the time of the present convention, which marks the second year of the establishment of the Radio Section, radio representatives have acquired a wealth of knowledge on all phases of their activities by virtue of the contact between radio manufacturers and electrical manufacturers. That the presentation of papers before the various meetings of the association by those engaged in electrical manufacturing, has materially enhanced the working knowledge of the radio producers, is indicated by the measures adopted by the latter at the recent convention. These measures, when carried by the radio membership, will make for simplicity in design and operation of radio equipment of every description and the standardization of complete sets and parts.

The Committee on Publicity has adopted measures which set a definite policy with respect to future shows and exhibits, these measures to be helpful to the radio memberships of the association. Recommendations were made for the establishment of a centralized office from which newspapers, radio magazines and others interested might apply for information on radio subjects.

During this convention the following officers for the Radio Section of A. M. E. S. were elected to serve during the period of June, 1923, to June, 1924: Chairman, E. B. Mallory, Westinghouse Electric & Mfg. Co.; Eastern Vice-Chairman, D. R. Murdock, William J. Murdock Co.; Western Vice-Chairman, C. E. Hammond, Signal Electric & Mfg. Co.; Secretary, Quinton Adams, Radio Corporation of America; Treasurer, George E. Eltz, Jr., Manhattan Electric Supply Co.

General Electric Handling Tremendous Business

ORDERS received by the General Electric Company for the six months ending June 30 totaled $164,263,755, compared with $114,219,248 for the corresponding period of 1922, or an increase of 44 per cent., according to a statement made public last week by President Gerard Swope. For the first quarter the orders totalled $84,249,710, as compared with $62,883,948, or an increase of 34 per cent.

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D. X. FANS

Send your name with type of set for details regarding the RaDioXor—the sensation of 1923.

WILLART SALES CO.
110 West 40th St. New York City

Sell Shirts

Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition.
WRITE FOR FREE SAMPLES.
MADISON SHIRT CO., 503 B'way, N.Y. City

ON APPROVAL FOR 30 ¢
ZOBEL-STEIN LABORATORIES
322 9TH ST. BROOKLYN, N.Y. SOUTH 2650

WD-11 and WD-12
TUBES REPAIRED

WD-11 or WD-12	$3.50
C-300 or UV-300	2.75
C-301 or UV-301	3.00
C-302 or UV-302	3.50
C-301A or UV-301A	3.50
Moorehead Detectors	2.75
Moorehead Amplifiers	3.00
DV-6 or DV-6A	3.00
Also the new UV-199	3.50

All tubes guaranteed to work like new.
Mail Orders Given Prompt Attention
"24 Hour Service"
NEW DX 1½ VOLT TUBES $4.00
RADIO TUBE CORP.
59 Halsey Street Newark, N. J.
TUBES SENT PARCEL POST, C. O. D.

Explaining Aerial Discharges on Steamer

Editor, RADIO WORLD: In reference to the query from E. M. Pace, of 807 Cherry Street, Vicksburg, Miss., in the June 23d issue of RADIO WORLD, I would like to advance the following theory which may possibly explain the electrical discharges from his aerial on the Mississippi steamer.

Though it is not possible accurately to state the cause without observing conditions as they existed, I would offer the explanation that the discharges from his aerial were due to negative charges being carried away through small particles of matter which came in contact with it. These particles might be dust, carbon (in the smoke) or water from steam. The latter would tend to explain the excessive discharges when the boat whistled, since the whistle would probably be equivalent to turning loose at boiler pressure a good-sized pipe of steam.

It is a well known fact that an insulated conductor will have a charge of approximately 60 volts for every meter that it is distant from the earth, provided the negative charge can be carried off. This may be accomplished experimentally by suspending an insulated metallic vessel in the air and allowing water to drop slowly from it.

If a condenser was used in series with the lead-in, this charge would be stored till the air gaps between plates could be broken down.

The fact that this phenomenon was not present at night may have been due to dampness in the air allowing the charge to leak off as it was formed, or the fact that the smoke or steam did not pass the aerial due to change in direction of the wind or the boat. The starting up of the boat's generator at night also may have had considerable effect on neutralizing the removal of negative charges from the aerial, as suggested by Mr. Pace. It is entirely possible that the generator may have had the negative lead grounded, either intentionally or accidentally. This ground would extend to the stack or steam piping, thus giving the small particles an initial charge, so that further charges could not be carried away from the suspended wires; or if other suspended matter were responsible for removal of charges, enough charges of opposite sign would be added to neutralize the effect. This principle has recently been demonstrated by Prof. Bancroft, of Cornell University, in his experiments for dispersing clouds by use of charged particles of sand. These unite with oppositely charged particles of water and fall as rain.

In the opinion of the writer this method of producing a charge on an insulated conductor is responsible for a goodly portion of the so-called "static" which is far less noticeable when a loop aerial is in use that is not subject to this effect. I believe it might lead to interesting results if the Bureau of Standards or other capable organization would make some tests along these lines with the object of reducing static by use of initial charges on the antenna.

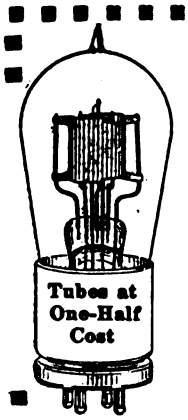
This condition, I believe, could be relieved, to some extent at least, by using either the condenser shunted around the primary tuning coil instead of in series; or, better still, by using a tuning arrangement in the aerial circuit which would not require a condenser. These arrangements would leave the aerial practically grounded and thus carry off charges as they were formed, though possibly with the accompaniment of considerable "static."

Another preventative would probably be the relocation of the aerial so that no smoke or steam would pass it; though it is possible that there might be enough suspended particles in the air to still give the effect.

Hoping this discussion will help a fellow-reader of the RADIO WORLD as many others have aided me, I am,

Very truly yours,
J. FRANK NAUGLE.

251 Maple Street,
Brooklyn, New York.



IT HAS HAPPENED TO ALL OF YOU IN A FRACTION OF A SECOND!

WHEN the filament burns out, at least $5.00 goes with it to put the set in operation again.

WHY not save nearly one-half the cost of a new tube by sending us your burned out or broken tube to be repaired?

WE REPAIR EVERY TYPE OF tungsten wire filament receiving tube. All our tubes are TESTED and GUARANTEED to function as well as when new.

All tubes returned P. P., C. O. D.

HARVARD RADIO LABORATORIES
BOSTON P. O. BOX 1781 MASS.

RADIO FANS

Do you want to sell your old set?
Do you want to exchange anything for something?
Do you want to buy something?

If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

Try Radio World's Classified Department for your personal radio and other needs.

RADIO WORLD, 1493 Broadway, New York City

The Small Boy Chooses Radio

WHEN a small boy is confronted by the problem of choosing between a radio concert and studying for examinations, the radio generally wins—that is, if mother and father are not near to influence the choice.

A ten-year-old Philadelphia youngster, writing WGY at "Skednety," N. Y.—Schenectady was a little bit too much for him—took advantage of his mother's absence and scribbled a note to WGY as follows:

"I was one of your manny radio fans of Tuesday night, June 18, 1923. I wish you to accept a thousand compelments from me. I am only a boy ten years old and a radio fan. I have built a set with a peanut tube. My mother says I pay more attenchion to it than to my studies and this leter looks it. I was lisning Tuesday night to WFI in my own city and all of a suddan I heard in a stearn loud voice 'this is station WGY, the next number is——' I blotted out WFI intirly. You had some power. Oh boy!"

"Verry cincerely Yours."

(Name withheld for reasons shown in postscript.)

"P. S.—My mother is out I guess it looks it. Please excuse this as I haf to get it out to you before she sees it. She will tare it up and say 'Get to your studies young man,' as my examanations are going on."

Evidently mother came in before the young Philadelphian could get a stamp for his letter. In the upper right hand corner, generally decorated by a postage stamp, he had written, "Collect on the other end please."

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Future of Radio on the Pacific Coast

IN any business, as in radio, certain portions of the United States respond more readily, buy more freely than others. This is chiefly an economic condition. Respecting this declaration it might be truthfully stated that the Pacific Coast is the "bright spot" in the radio business to-day.

Radio manufacturers and wholesalers say there are two chief reasons for this —the climate lends itself to easy reception of broadcast matter and secondly, the excellence of the broadcast programs.

Human nature, in most cases, leans towards laziness; it is only natural that they should seek luxury. If the climate on the Pacific Coast permits facile reception and does away with tedious "tuning in" the public is certainly more interested in doing something where they can easily obtain a result. Hundreds and thousands of dollars have been spent by private enterprise in the perfection of broadcasting apparatus and the securing of artistic entertainment, with the direct result that the public is eager to "listen in," knowing full well they will hear something worth while.

It is logical to conclude that with the varied programs, large number of Class B stations, a suitable climate to enable easy operation of radio sets, a greater proportion of the western Pacific public would be inclined to experiment along radio lines.

Numerous opinions and analyses have been printed on the economic trend of radio business. In the last analysis it is merely a repetition of what has happened in many other businesses. With the country-wide interest aroused in radio, manufacturers went wild, produced sets and supplies not for the purpose of improvement or quality, but to supply the demand. In 1922 the Pacific Coast market was flooded with "junk" and it has taken six months to liquidate these goods. Prices were smashed. Competition was keen. Hundreds of inexperienced men, who had entered the radio business with no knowledge of what they were selling, went to the wall, sold out and quit. Radio then began to stabilize itself.

We all know the story. New prices —better apparatus—a continual striving for long distance reception—new inventions and a hundred and one other issues. The Pacific Coast was hit hard and took longer to recover because radio had instituted itself very strongly into the daily life of the western public.

It is a proven fact that radio is here to stay and its future on the Pacific Coast is dependent upon the prices of eastern manufactured goods and the merchandising service rendered. If the western public can get their goods when they want them and at a price to suit their pocketbooks, they will buy.

Advertising has played a great part in the development of radio business on the Pacific Coast. Month after month national radio periodicals have placed their columns before our buying public, showing every conceivable make and style of suitable apparatus and the public have bought. Sometimes they have been satisfied, sometimes not, and it still remains true that the greater part of developed business in the west has been due to systematic advertising in local and national periodicals as well as the efforts of the local representatives.

The Pacific Advertising Agency has for the past year, centered a large part of its energy in the placing of radio advertising copy. They saw in that field an opening to develop sensible advertising. It has been their endeavor to "prick the bubble" of sensationalism, do away with vague and misleading copy and advertise radio goods for their actual worth. Pacific Coast manufacturers have backed them up in their effort, realizing that the ultimate success of their business either in the West or the East, was partially dependent upon a true portrayal of their product's worth.

Maintenance of a policy of conservatism will increase the confidence and trust of a sadly misled public and make for bigger strides in the future of radio.

Perhaps the most potent factor from an advertising manufacturer's viewpoint, is the value of keeping his name before the public. Competition is too keen on the Pacific Coast to trust to the individual sale as an advertiser. The public is confused. The buying field is large. The buyer must choose. And what does he buy? Generally a well advertised product that has proven its worth and practicability, for the Pacific Coastean is well known as a skeptic. It is only the truth which will bring the radio public to a greater confidence in the radio wholesaler and retailer.

General Electric's Wonderful Increase in Sales

THE annual sales of the General Electric Company increased from about $12,000,000 to $243,000,000 in the thirty years between January 1, 1893, and January 1, 1923, according to a statement issued by the company.

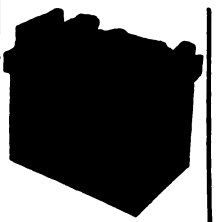
The outstanding capital stock increased from $35,000,000 to $184,000,000, and the value of its manufacturing plants from $4,000,000 to $167,000,000. The number of employes grew from 4,000 to more than 74,000.

The statement was issued as a review of the corporation's accomplishments under the leadership of Charles A. Coffin, who is retiring as chairman of the board after thirty years of continuous service. Tribute is paid also to the accomplishments of E. W. Rice, Jr., former president of the corporation, and to its corps of engineers, including Professor Elihu Thomson and Dr. Charles P. Steinmetz.

Mention is made of Thomas A. Edison, who gave the world the first central plant in which to generate electricity for public lighting.

Fifty-two issues for $6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

YOU SAVE 50% OF THE USUAL COST



2 VOLT STORAGE BATTTERY for WD11—WD12 $5.00
6 Volt, 60 Amps. $10.00
6 Volt, 80 Amps. 12.50

World Radio Batteries
Are Guaranteed 2 Years in Writing
Will ship C. O. D. subject to inspection, or allow 5% discount for cash with order. Order shipped same day received. WRITE TODAY.
World Battery Co.
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1218 So. Wabash Ave.
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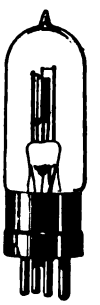

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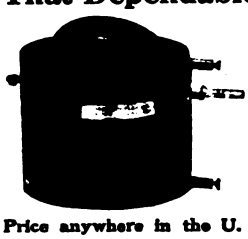

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Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want.
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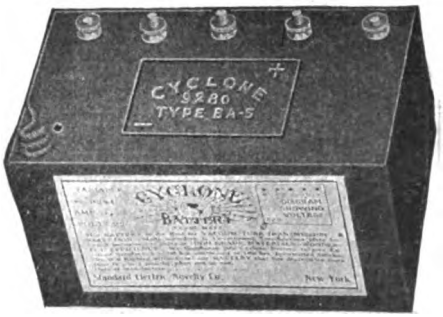

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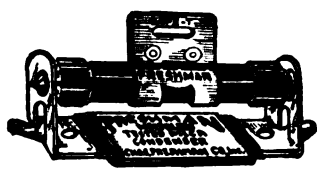

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Radio Condenser Products

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Broadcasting Forecast in "Looking Backward"

DO you remember the interest created in 1887 by the book "Looking Backward," written by Edward Bellamy? He was classed as a new Jules Verne, but many people hooted derisively at some of the prophecies in his story. If you are too young to have read Bellamy's book ask your parents or grandparents if they remember the passages quoted below. They certainly read like an inspired forecast of present-day radio broadcasting:

"Come, then, into the music room," she said; and I followed her into an apartment finished without hangings, in wood, with a floor of polished wood. I was prepared for new devices in musical instruments, but I saw nothing in the room which, by any stretch of the imagination, could be conceived as such. It was evident that my puzzled appearance was affording intense amusement to Edith.

"Please look at today's music," she said, handing me a card, "and tell me what you would prefer. It is now five o'clock, you will remember."

The card bore the date of September 2, 2000, and contained the longest program of music I had ever seen. It was as various as it was long, including a most extraordinary range of vocal and instrumental solos, duets, quartets and various orchestral combinations.

I observed that this prodigious program was an all-day one, divided into twenty-four sections, answering to the hours. There were but a few pieces of music in the 5 p. m. section, and I indicated an organ piece as my preference.

She made me sit down comfortably, and, crossing the room as far as I could see, merely touched one or two screws, and at once the room was filled with music of grand organ anthem.

"Grand!" I cried as the last great wave of sound broke and ebbed away into silence.

"Wait a moment, please," said Edith. "I want to have you listen to this waltz before you ask any questions." And as she spoke the sound of violins filled the room with the witchery of a summer night. When this had ceased she said: "There is nothing in the least mysterious about the music, as you seem to imagine. It is not fairies, or genii, but by good, honest and exceedingly clever human hands. There are a number of music rooms in the city perfectly adapted acoustically to the different sorts of music . . . connected . . . with all the houses of the city whose people care to pay the small fee. . . .

"There are on that card for today, as you will see, district programs of four of these concerts . . . which can be heard by merely pressing the button. . . .

"The programs are so co-ordinated that the pieces at any one time simultaneously proceeding in the different halls offer a choice not only between instruments and vocal, and between different sorts of instruments, but also between different motives from grave to gay, so that all tastes and moods can be suited."

Zion Broadcasting Station WCBD

STATION WCBD, owned and operated by Wilbur Glenn Voliva, is located at Zion, Ill., on Lake Michigan, midway between Chicago and Milwaukee. The station slogan is, "Where God Rules Man Prospers." J. H. Depew, manager, writes to RADIO WORLD as follows:

"We have been requested by various listeners to our station and programs to furnish your magazine with our schedule and call letters.

"I am enclosing schedule, and you will note that we broadcast on 345 meters, or under the new arrangement of 870 kilocycles frequency, and that our call letters are WCBD.

"This is a standard Western Electric equipment with 'T' type aerial, and 150-foot towers, standing at an elevation of 234 feet above Lake Michigan. At present we are using two oscillating tubes of 250 watts each and two tubes of modulation.

"This station, complete, cost about $40,000, and is said to be one of the best equipped in the country.

"A cordial invitation is extended by the management to the editor and any one associated with your valued magazine to pay us a visit at any time you are passing this way.

"Station WCBD is located in plain view of Sheridan Road in the city of Zion, and is open to receive visitors every weekday."

The schedule sent by Mr. Depew reads:

EVERY LORD'S DAY (SUNDAY)

Zion Orchestra, from 9:00 a. m. to 9:45 a. m.

Principal Service of the Entire Week, from 2:30 p. m. to 5:30 p. m.

Special Music by Zion Band, Organ (one of the largest in the world), and Zion White-Robed Choir.

Address by Wilbur Glenn Voliva, General Overseer of the Christian Catholic Apostolic Church in Zion.

EVERY MONDAY

Concert, beginning at 8:00 p. m.

EVERY WEDNESDAY AND FRIDAY

From 2:30 p. m. to 3:45 p. m.

Sacred solos and duets, and an address either by Wilbur Glenn Voliva, General Overseer of the Christian Catholic Apostolic Church in Zion, or one of his representatives.

EVERY FRIDAY

Concert, beginning at 8:00 p. m.

All broadcasting is done on local daylight saving time.

This schedule effective until October 1, 1923.

Preparing for the New School Term

Radio World wants a representative in every grammar, high and preparatory school in the United States and Canada.

We have a special proposition that will enable representatives to make money. Appointments made now. Give name of school you will attend in the Fall.

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Heard Over the Radio Counter

PART XXI.

WHEW, gosh all fishhooks, but it sure is warm! Are you too warm to give me a little information?"

"You're right, it's warm, but as for the information, if I can give it, why summer or winter does not matter."

"Well, I had my set out in camp last week, and it was working fine and dandy, until that terrible rain storm. I think it must have gotten wet, but I don't see how it could, as I had it sitting on a box; ever since, I can't seem to get it working right Probably you can give me some idea of why it doesn't function since then."

"Wow, man, you sure are a bear at asking questions, but tell me where were your batteries?"

"Oh, I had my filament battery in the cabinet, but I left the B battery down on the ground. It got soaked, but I laid it in the sun and it dried out all right. I just bought it before I left, and it looks O. K."

"There is your trouble, old man. It is a funny thing, but I had another camper in here this morning who told me the same thing, only he had his set in a car, and the batteries got soaked. I think if you get another battery you will find that your trouble was right there."

"O. K. You had better give me one right away. Say, what is that funny looking thing there?"

"Why, a new loud speaker that is very good. Would you like to hear it?"

"I don't mind if I do, I have to get one sometime, so I had better start looking around now and get some idea of what they are."

"Will you step over here? I'll show you how it works on a detector and one step."

"Why, that sounds real clear. Who is that?"

"It must be WJAQ, because they were on about ten minutes ago."

"What is the price of that?"

"That sells for $6.00, with six feet of green cord and a plug to connect it with. Say, listen to that violin! Sounds natural, doesn't it?"

"Well, if I didn't know that it was coming from that funny looking thing I would think that he was right here. Better pack that one up for me. I don't think I can go wrong, and I don't want to make the mistake I did before. I waited for tubes to come down, and they went skyrocketing up instead, so think I will take it now."

"Perfectly all right with me. Just one moment, and I will have it wrapped up for you."

"Here you are. That is the correct change, so I won't wait for a slip. Here, take a smoke on me. Well, guess I will trot along, and get it working."

"Good day, sir. Drop in anytime I can help you along."

"Thanks, I will. Good-bye."

Ideal Control For All Tubes Especially U.V. 199's

Patented

and all dry cell tubes, permits accurate and superfine adjustment necessary at critical operating point. Utilizes great tuning possibilities of vacuum tube itself.

Replaces the rheostat! Occupies little space on panel. No redrilling necessary.

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—filament control eighteen times greater than with a wire rheostat and many times that of any other so-called filament control.
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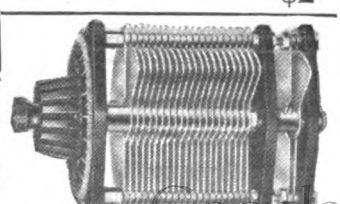

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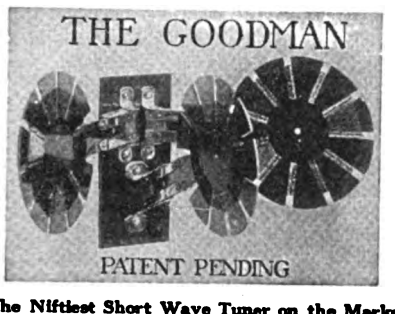

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RADIO WORLD

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Protection of Trade-Marks in Latin-America

THE Inter-American High Commission has issued a detailed explanation of the convention adopted at the recent Santiago Congress to harmonize American and Latin-American laws affecting trade-mark and patent protection.

There is a fundamental difference, it is explained, between the trade-mark laws of the United States and those of Latin America in that right of protection to a trade-mark is obtained in the United States through use, while in Latin America such protection is obtained through registration.

"The provision which covers this essential difference in the national practices is especially important for the American trade-mark owners," says the statement, "and it is believed that, giving them full protection, it does not violate in any way the laws of the Latin-American countries. The main principle which has inspired the convention is the principle of protecting rights legitimately acquired."

One article of the convention provides that "all differences between the contracting states relative to the interpretation or execution of this convention shall be decided by arbitration."

Tore It to Scraps

ONE of our readers writes to tell us this: Last week the local broadcast station made the following announcement: "Miss Xantippe will now render that famous ballad entitled 'Kiss Me Again.'" Believe me, fellows, she didn't rend it—she positively ripped it to shreds!

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Take Radio Camping With You

By Velma Carson

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IT takes one more paddle to go canoeing nowadays than it used to. Besides the one for propelling the boat, there must be a paddle for catching concerts.

And besides a girl, some cushions, a camera, and a lunch basket, the young man takes along a small radio receiving set. They come now in small boxes with a handle and are as easy to carry as any of the aforementioned prerequisites to the successful canoe trip.

He puts the set between himself and the girl in the bottom of the boat, places the extra paddle perpendicularly against the back of the seat and has her lean on it to hold it secure. Then he attaches one wire to the upright end of it for an aerial and trails the other wire in the water to ground his circuit. They put on the headphones. He tunes in to the nearest station and paddles off to the shadiest nook he can find.

Imagine this canoe on a moonlight night away off down the river and an unseen orchestra playing "Melody of Love"!

If there is any time in the world that a person is in the mood for good music it is at the end of a long, thrilling day exploring in the woods or doing any of the relaxing things that are a part of camp life.

Even the rattlety-bang piano player with a one-sided repertoire, or the banjo picker who knows eight old songs, or the sixteen-year-old with a thin voice and ukulele have always been welcome in a summer camp. Well, if the man who can improvise on a mouth organ has had his share of appreciation out in the woods, the radio, with its diverse programs, is sure to be listed right along with the iron skillet when the question comes up concerning camping paraphernalia.

The business man who wants to hide himself from business annoyances, the telephone, newspapers, and other people, can still get the news of the day and satisfy his curiosity about the baseball scores.

If mother does not care about too much strenuous hiking and swimming, she can be sure of having entertainment while she rests in camp. The children can be kept occupied at the awful hour of bedtime, and the young people can have dance music without the trouble of importing a victrola or a piano. Besides, if one is to go into wilds sufficiently wild these cumbersome instruments are practically impossible.

One group of Camp Fire Girls learned the joy of doing interpretive dancing in their bare feet on grassy slopes near their camp in the North Woods by radio last summer. They also studied the art of telling stories from the Dreamtime Lady.

It is no small help in any camp to get the weather report and river conditions.

"Humoresque" goes beautifully with bacon and eggs or trout and flapjacks, and does not detract in the least from the chirp of crickets.

Fans, Watch Your Step

NOW that no broadcaster from the United States reaches Porto Rico we wonder what will our friends do for a list of stations heard. A little imagination and a good radio call book can accomplish wonders. Be careful how you connect that ¼-kw. "coffin" to the S. P. D. T. switch. The boys at the university must have made a mistake.—*Porto Rico Radio News.*

Get Them While They Last!

Useful Technical Articles Published in 1922 Issues of RADIO WORLD

See prices at end of this page

APRIL 1.

A 500-Mile Radiophone Employing a 5-Watt Tube, by Frank A. Hahnel.
"Tell Me, Please, How Will This Set Receive?" by E. L. Bragdon.
Short Cuts in Receiver-Circuit Design, by O. C. Roos.
Making a Short-Wave Regenerator, by Fred. Chas. Ehlert.

APRIL 8.

Do You Know Your Receiving Equipment, by James D. Gordon.
Why a Crystal Is Called a Rectifier, by Walter Emmett.
Is Radiotelephony Dependable? by O. C. Roos.
Mounting Crystals in Your Detector, by E. L. Bragdon.
Storage Batteries for Radio, by Fred. Chas. Ehlert.

APRIL 15.

First Principles of Electricity as Applied to Radio, by John P. Miles.
Your Storage Battery, by E. L. Bragdon.
What Makes Radio Possible, by Edward Linwood.
Ground Connection as Vital as Antenna, by Fred. Chas. Ehlert.

APRIL 29.

Valuable Pointers on Aerial Construction, by Edward Linwood.
What is Meant by Tuning, by E. L. Bragdon.
Radio-Frequency Amplification and Regeneration, by Frank Armstrong.
Honey-Comb Coils and Condensers, by Edward Linwood.
Charging the Storage Battery, by E. L. Bragdon.
How to Construct the Variocoupler, by Frederick J. Rumford.

MAY 6.

The Advantages of Radio Frequency, by Harold S. Potter.
How to Construct, Protect and Operate a Storage Battery, by George W. May.
The Beginner's Catechism, by Edward Linwood.
Tuning and What Is Meant by It, by Fred. Chas. Ehlert.
New Frequency Amplifier Brings Faintest Waves in Strong, by G. W. May.

MAY 13.

My Practical V. T. Detector and Two-Stage Amplifier, by Frederick J. Rumford.
The Principles of Radiotelegraphy, by Walter J. Howell.
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Tuning as Applied to Telegraphy, by Walter J. Howell.
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Making Signals Louder with Two-Stage Amplifier, by George W. May.

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Design for an Amateur's Receiving Set, by C. White.
Simple Method of Recharging a Storage Battery, by John Grayson.

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Radio Receiver for Short Waves, by George W. May.
How to Filter Atmospheric Conditions, by C. White.
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How to Construct One- and Two-Slide Tuning Coils, by George W. May.

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The Vacuum Bulb's Start in Life, by C. White.
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Test of Inductance Coils, by Fred. Chas. Ehlert.
Short Waves from a Simple Receiver, by Stanley Bryant.

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Novel Unit-Detector and Amplifier, by Frederick J. Rumford.
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How Wave Lengths Travel, by Fred. Chas. Ehlert.
Radio World's Revised Dictionary, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Use of the Vacuum Tube Detector, by George W. May.

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Armstrong's Superregenerative Amplifier Fully Explained, by John Kent.
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Reducing Strays and Static, by Fred. Chas. Ehlert.

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Combined Radio and Audio Frequency Amplification, by C. White.
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Facts for Beginners, by Fred. Chas. Ehlert.

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When Your "Movies" Come by Radio, by Stanley Bryant.
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Practical V-T Detector Panel, by Frederick J. Rumford.
Revised Radio Dictionary, by Fred Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Importance of Aerials to Radiation, by C. White.

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The Vacuum Tube as a Transmitter, by Charles H. Plath.
My 20-Kilowatt Tube and its Uses, by Irving Langmuir.
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The Truth about Lamp-Socket Aerials, by Harold R. Hart.

AUGUST 12.

The Work of the Audio-frequency Transformer, by George W. May.
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Experimenting with Armstrong Circuit Produces Unusual Hook-up, by Dr. O. S. Kelly.
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How to Build a Portable Field Buzzer, by De Witt H. Thompson.
Using Two Tubes for Receiving, by C. White.
The Storage Battery as an Important Factor in Radio Reception, by Donald Van Wyck.
The Use of Capacity in a Circuit, by George W. May.
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AUGUST 26

How to Build a Spider-Web Receiver, by Frederick J. Rumford.
My Detector and One-Step Amplifier, by Fred. Chas. Ehlert.
The Beginner's Catechism, by Edward Linwood.
Hints for Fans, by C. F. Rye.

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Generating C-W for Transmission, by C. White.
Wonders of Radio-Frequency Amplification, by H. S. Potter.
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Practical Circuits for Regenerating Loud Signals, by O. S. Kelly.

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Radio Ideas for the Amateur to Test Out by Carl Masson.
How to Make a Practical Wave-Meter, by Frederick J. Rumford.
How to make a Honey-Comb Coil with a Two-Stage Amplifier, by Fred. Chas. Ehlert.
Perfect Short-Wave Radio-Frequency Amplification, by George W. May.

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How to Make a Two-Tube Superregenerator by Frederick J. Rumford.
Methods of Amplifying Radio Signals, by B Bradbury.
Voice Distortion in Vacuum-Tube Receivers, by W. A. Dickson.
Charging a Battery—from a French Radioist's Point of View, by Marius Thouvais.
Working Diagrams for Beginners.

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New V T Hook-up Worth Testing Out, by P. F. Metzler.
New Method for Lighting Filaments, by C White.
Why the Radio Compass Is the Fighting Element of Science, by Ortherus Gordon.
Complete Table of Symbols Used in Radio Reception, by Fred. Chas. Ehlert.
The Radio Primer, by Edward Linwood.
Complete Method for Building an Electron-Tube Detector Unit, by Experts of the United States Bureau of Standards.

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Increasing the Wave Lengths of a Receiving Set, by George W. May.
The Importance of the Variometer to a Receiving Set, by Donald Van Wyck.
Successful Stunts of an Amateur Radioist, by C. F. Rye.
Employing Jacks with a Two-Stage Amplifying Receiver, by Fred. Chas. Ehlert.

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Superheterodyne Receiver as Applied to the Armstrong Superregenerative Circuit, by Charles R. Leutz.
Constructing a Radio-Frequency Regenerator, by C. White.
Why the Open Antenna Is Best for the Radio Listener, by C. D. Wagoner.
Broadcasting Stations of United States and Canada.
The Radio Primer for the Beginner, by Lynn Brooks.

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Neat Home-Made Tube Socket, by Gordon S. Arthur.
Vessels Now Guided Through Fog by New System of Radiotelegraphy, by Otherus Gordon.
What Makes the Receiver Work, by Donald Van Dyck.
Using the Variocoupler in a Short-Wave Receiver, by George W. May.
Regenerative V-T Receiver for Short Waves, by Fred. Chas. Ehlert.

OCTOBER 28.

A simple Super-regenerative Receiver, by Harold S. Potter.
Vacuum Type of Arrester Safe, by Fred. Chas Ehlert.
How to Make Your Aerial Function, by Horace Beers.
How to Avoid Interference When a 360 Meter and a 400 Meter Station Are Operating Simultaneously, by C. W. Horn.

NOVEMBER 4

Receiver for Amplifying Weak Signals, by Horace Beers.
How to Learn the Code, by Ortherus Gordon.
Detectors—and How They Work, by Donald Van Wyck.

NOVEMBER 18

Radio Devices You Should Understand, by John Kent.
The Counterpoise, by Frederick J. Rumford.
Changing Inductance and Capacity, by Fred. Chas. Ehlert.
The Importance of Understanding and Testing Radio Apparatus, by C. White.
Operating a Three-Unit Honeycomb Regenerative Receiver, by John Kent.

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Why Radio Frequency Amplifies Signals, by Donald Van Wyck.
Capacitively Coupled Receivers, by A. O. Curtis.
Efficient Crystal Set, by C. H. Plath.
How to Prepare Hard Rubber Sheeting for Your Panels, by W. S. Standiford.

DECEMBER 16, 1922

How to Put a Vernier on Your Condensers, by Ortherus Gordon.
A New Three Slide Regenerative Tuner Hook-Up, by R. L. Dougherty.
Factors That Affect the Range of Transmitters, by B. R. Cummings.
New List of Broadcasters Recently Licensed.

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A New Application of the Power Amplifier, by Frederic W. Proctor.
My Simple Inexpensive Receiver, by O. White.

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How to Make a Single-Blade Vernier, by Ortherus Gordon.
Peanut-Tube Hook-ups I Have Used Successfully, by P. F. Metzler.

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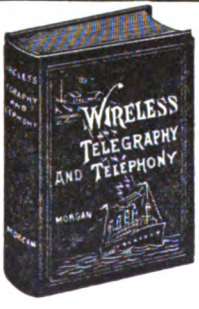

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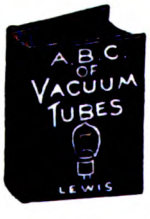

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RADIO RECEIVER KEEPS BOY SCOUTS HAPPY IN CAMP

(C. Photonews, N. Y.)

Boy Scouts in their camp at Kanohwahee Lakes, N. Y., spend their idle hours listening to radio music from the big broadcasters. The picture shows a group enjoying a radio concert under the shade of the trees at the edge of the lake.

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Big Opportunities for Inventors in the Radio Field

RADIO is undoubtedly the most fertile field for the development of invention that man has under cultivation at the present time, says a writer in the New York *Tribune*. Moreover there is the greatest possible incentive to invention because of the intense public interest which broadcasting has brought about.

All of the big industrial companies are fully aware of the possibilities, and they maintain extensive research laboratories in order to solve the problems which face them in the orderly evolution of the radio art.

As a result of the stupendous growth of radio as an amusement enterprise through the medium of broadcasting, the other aspects of the art have been to a certain extent overlooked, yet they are as a matter of fact vastly more important. Just think what radio communication is as a method of insuring life and property at sea, especially the radio compass in protecting valuable ships!

Take, for instance, the value of radio in cases of distress. The difficulty of equipping every vessel which floats is not so much a question of expense for apparatus, as one of expense in maintaining operators aboard so that a continuous watch may be had. Most of the tramp steamers would be quite content to have apparatus aboard which would flash the distress call in case of need.

Under these circumstances an automatic device which would continuously send out the distress call when the captain of a tramp steamer pressed a button would be a most valuable contribution to the art. Such an apparatus would adequately cover the needs of the tramp steamer because the radio compass instruments upon other ships or at land stations would enable other operators to get the necessary information the moment they heard the distress call.

The greatest drawback to the development of trans-Atlantic wireless communication at the present moment is interference. Continuous wave telegraphy has improved matters a great deal, but there is still a lot left to be desired.

Radio, while it may not immediately supplant the cable, will in the near future supersede it. The reason is that in radio there is none of the inherent difficulties which exist in cable operation. Theoretically there is no limit to the speed which trans-Atlantic wireless communication can be operated at. Automatic transmitting and receiving equipment already allows a speed of 200 words a minute under favorable conditions. This may eventually be increased to 1,000 words a minute.

If some means could be devised whereby dots and dashes could be dispensed with altogether and an electrical recording instrument operated by variations of frequency in alternating current above the range of human hearing the problem of interference would be quickly eliminated.

Audible frequencies, roughly speaking, range from 200 to 5,000 alternations a second. Above the latter figure there is a tremendous range which could be taken advantage of in the formation of a code of signaling, provided apparatus could be perfected which would follow the rapid change in frequency and record those changes.

In this manner continuous application of modulating current would be obtained and the present system of breaking up the current to form the dots and dashes would be avoided. Such a method would also take away the present interference caused by the low wave telegraph stations upon broadcast reception. It would, in fact, leave all of the audible band of frequencies for the exclusive use of radio telephony.

It is hardly necessary to point out the need for a static eliminator. The inventor of such a device would be in a position to write his check for any amount of money his fancy might dictate. It would at once remove the curse from all wireless telegraph communication and permit the instantaneous linking up of every part of the world in the most economical manner.

For broadcast listeners it would be an inestimable boon, and from this source alone a very large fortune could be obtained by the successful inventor. In the realm of radio telephony it would enable us to establish immediately day and night telephone communication with all parts of Europe in such manner that the radio system could be effectively and economically linked up with the land telephone systems on both continents.

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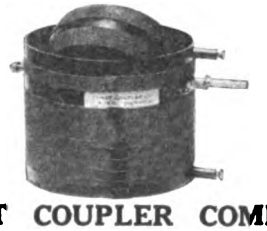

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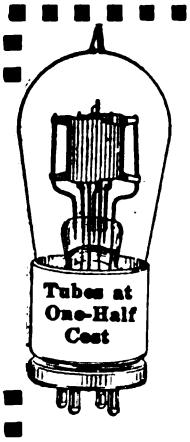
French Airplane Steered by Wireless 250 Miles

A PARIS dispatch to the Associated Press states that a French government airplane has successfully completed a flight from the Saint Assisses wireless station to Tours and return, a total of about 250 miles, steering only by wireless.

The indications were received on an apparatus called the radio goniometer, which showed the airplane's position with relation to the wireless station. This device enabled the pilot to make the journey with an error of only 2 per cent in direction on the outward flight and with entire accuracy on the return.

The test was announced as proving the practicability of such a method for night flying.



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VOLUME THREE OF

RADIO WORLD

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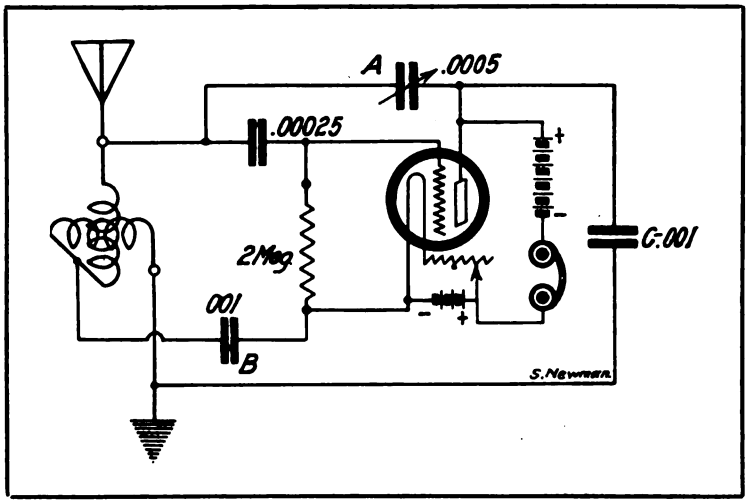
A Dry-Cell Tube Circuit That Will Surprise You

By A. D. Turnbull

THERE has been much said lately about the relative capabilities of single circuit sets versus tuned circuit and the interference caused by re-radiation in the case of the first mentioned type. Discounting the fact that a single circuit set in the hands of an amateur is capable of creating a private bedlam all its own, there is probably no type of circuit yet discovered that will give the volume on one tube that this type will deliver. Furthermore, when you combine capacity feedback and the super-regenerator principle, a circuit of this type will produce signals that are equal to a triple circuit with at least one stage of audio and radio-frequency amplification.

A circuit that is easily controlled and that will, if operated properly, produce exceptional results in both distance and volume, is shown on this page. As can be seen it combines several features not found in any other circuit. It is flexibility personified, as with an ordinary type of variometer and an antenna of from 75 to 100 feet in length it will tune from 180 to 600 meters with no trouble at all. It is as efficient on 200 meters as it is on 600, not losing any volume or selectivity at either extreme.



Circuit diagram of a receiver that will enable the average fan to reach out and corral the long distance. Watch the condenser capacities.

Apparatus necessary for the construction of this set is easily obtainable as there are no parts that have to be specially constructed or sought for. They are: 1 variometer; 2 .001 fixed condensers; 1 .00025 grid condenser (no leak); 1 grid leak, 2 megohm (preferably tubular type); 1 .0005 vernier variable condenser; 1 dry cell tube; 1 socket; 1 vernier rheostat.

When constructing the set pay particular attention to keeping the leads separated and well insulated. If leads are allowed to run parallel the whose purpose and scheme of the receiver will be defeated as due to the capacity feedback and coupling, any extra capacity which is allowed to enter the circuit will entirely destroy the principle of the set and you will have a set which tunes broad and has no volume.

Too much stress cannot be laid on careful construction, especially the location of the condensers A, B, C. These are the controlling features of this circuit and they should be located in such a manner that the leads from one cannot interfere with the leads of another.

When the set is constructed it is necessary to shield the panel, but it should not be grounded to the ground terminal. In this set it is much better to ground it to the minus side of the filament, as if grounded to the ground terminal, it will form one side of a condenser with your body through the phones as the other and every time you go to tune the set it will break out in the most awful howls and capacity effect will be so bad that you will have to tune it with a broomstick.

The set is tuned in the following manner: The feedback capacity A is set at about 50° and the variometer is turned till the carrier wave of a station is heard. The rheostat of the tube is then turned down until it is just above the point where it "clicks" out. If when tuning this part of the circuit it goes out, go back and re-tune the filament until it is just at that point. Then using the variable condenser, tune the set until the signals are clear and loud, clearing up all the noise with the vernier of the condenser.

As advantage of the super principle is taken, a lot of noise will ensue if the circuit is not tuned correctly. So if when the set is first tuned you get lots of funny sounds do not be discouraged but learn to tune it properly and you will find that it is a very selective and sensitive circuit.

Of great importance is the tapping of the variometer. The two winding of the stator and rotor are generally connected in a manner that makes this easy as most variometers use the shaft of the rotor to make the connection, but if yours doesn't, trace the windings and tap it with flexible wire.

If trouble in clearing up the signals is noticed you

(*Concluded on next page*)

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Influence of Radio on Arctic Expeditions

By Hendrick Hansen

SWINGING off to the top of the world!

A little packet of letters from members of the expedition to their friends at home, left at a tiny village at the northern coast of Labrador, and every Arctic exploration party turned toward the vast ice fields to the North with all ties to civilization broken. While their last farewells were carried back to the States, they proceeded slowly to the land of ice, darkness and Northern Lights. The world bid them "bon voyage" and forgot them for months and even years.

This briefly was the story of the departure of every Arctic exploring party of former years and the vast curtain drawn between them and home was sometimes never lifted; the hardships they were forced to undergo and the manner of their passing are mysteries never to be unfolded. As soon as their ship's anchor was hoisted at the white man's most northern outpost the trend of world events was to them closed.

How different it is now and what a contrast may be drawn between the famous Greely expedition and that in command of Captain Donald B. MacMillan who is now on his way to Ellsmere Land in the 89 foot auxiliary schooner "Bowdoin." Four strands of wire between the masts of this little vessel comprise the link that makes the parting easier and the future less doubtful.

Cheerfully will they leave their letters on the Labrador coast for they know that these are not the last farewells; radio will keep them in contact with the world below—there will be no good-bye—and while they wave a greeting to natives on shore, Donald H. Mix, their radio operator sent by the American Radio Relay League, may even then be communicating with amateurs 2,000 miles away, or listening to concerts from Chicago.

In the forecastle of the little vessel with headphones fastened over their ears members of MacMillan's crew, through this marvelous new adaptation of radio, will not only listen to the same concerts that thousands hear nightly at home, but what is of more value to them the latest news of world happenings from the Arlington station. And just as they will keep informed of national and international events as well as the result of a world championship bout or the outcome of the next presidential election, so will they describe their own vivid experience in scientific exploration.

The use of radio for Arctic work is new and untried and the results of the plan of communication, designed jointly by Captain MacMillan and officers of the American Radio Relay League, are expected to pave the way for future expeditions under vastly improved circumstances both as to the morale of the explorers and the enlightenment of science.

Should some sudden emergency overtake the exploring party and their rescue be brought about then the weeks spent in preparation, the painstaking care while the radio equipment was assembled and installed to the satisfaction of expert engineers, will not have been in vain and radio will have proved its value in a new field.

One of the spectators of MacMillan's departure from the Maine coast was Major General A. W. Greely, leader of the Greely expedition of 1881. "The whole cause for the death of 18 members of the party," he said referring to his own experience, "was due entirely to the fact that the relief expeditions failed to reach us and our supplies consequently gave out. Of the 25 members, seven were finally rescued, but one man who had lost his hands and feet died from the effects of experience in Greenland where the party stopped on its way home."

Under such circumstances what would radio have meant to the Greely exploration party? What may it mean to Donald MacMillan who is now on his way to the desolate ice fields where so many have gone but for one reason or another failed to return?

What power there is in four little strands of wire!

Ode to Electricity

By Will Chamberlain

SOME call you Jove, but back of you, I know,
There is a vaster Power that guides your flow,
That thrusts your zigzag saber through the sky,
Whose awful glitter quells and blinds my eye,
Whose magic lance rends to its heart the oak,
And smites the steeple with a sudden stroke;
Lights as with sunshine the on-rolling storm,
Causing the world to shrink from seeming harm;
Splitting the stubborn granite to the core,
Ere the slow thunder breaks with sullen roar—
And I bow down in reverence to the sod
Before a might that's god-like but not God.

Yet, scouting fear, I list you, marvelous friend,
Who at a finger's touch will noontide send;
Who, with your faithful, tiny suns, will light
The haunting blackness of the starless night;
Who at a button's pressure bids the cranks
And belts and wheels of workshops play their pranks
Of usefulness in Labor's priceless cause—
You, the invisible fashioner of laws.

And as the daring Franklin, from the shroud
Of thunderbolts that lesser souls had cowed,
Coaxed with his kite the tingling proof that we
Acknowledge everywhere on land and sea,
So I, the least of men, with frail lines plod
Before a force which says, "There is a God!"

(*Concluded from preceding page*)

can experiment with a smaller grid leak capacity, but for most dry cell tubes I have found that two megohms is about the correct capacity.

If the set is carefully constructed and directions are all closely followed, the builder will have a set that he can rely upon to bring in the most distant stations clear and undistorted and with a minimum of tuning.

Do You Watch Them?

MOST fans using dry cells for lighting their tubes never think of their batteries until they actually go dead on them. It is always a good plan to test them with an ammeter every so often. By doing this you can keep an accurate check on your filament supply and never need miss anything for need of "juice." Remember the old saying that runs something like this: "For want of a nail the shoe was lost, etc."

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Helpful Summer Hints for Listeners

THESE are ten good rules for broadcast listeners:

1. Don't try to hear Australia in midsummer. Be satisfied to enjoy the nearer stations most of the time.

2. Don't be disappointed if an occasional storm interferes with your summer radio evening. There are many fine concerts coming. You can't expect to find a pearl in every oyster, nor to receive a record-breaking concert every night.

3. If you want louder signals use a longer aerial, more tubes, higher plate voltage, more sensitive loud-speakers, and more careful tickler and receiver adjustment.

4. A pleasant signal filling a moderate sized room should be enough to give satisfaction. It is not worth while producing signals which deafen the neighbors. It is wasteful to insist on tremendous signals, which are generally less pleasant than moderate signals.

5. If your local station comes in too loudly and drowns others out, a smaller aerial will help in tuning him out, with a smaller condenser connected between aerial and ground. And if all measures to get rid of the local station fail, why not enjoy his concerts? He is working hard for you, and it is nobody's fault that you are so close to him that you are bound to hear him. Broadcast stations have to be closer to some people than to others.

6. For the new longer waves above 450 meters use a condenser connected between the aerial and ground terminals of your set.

7. A little patience in learning to handle your receiver yields rich returns in satisfaction from fine signals. Remember that "Rome wasn't built in a day" and keep on getting more and more familiar with your set and how it works.

8. It is a fine idea to read a good radio magazine or two. It helps you to know how your set works and keeps you up to date in radio. Information of this sort is an aid in getting the concerts loud and clear.

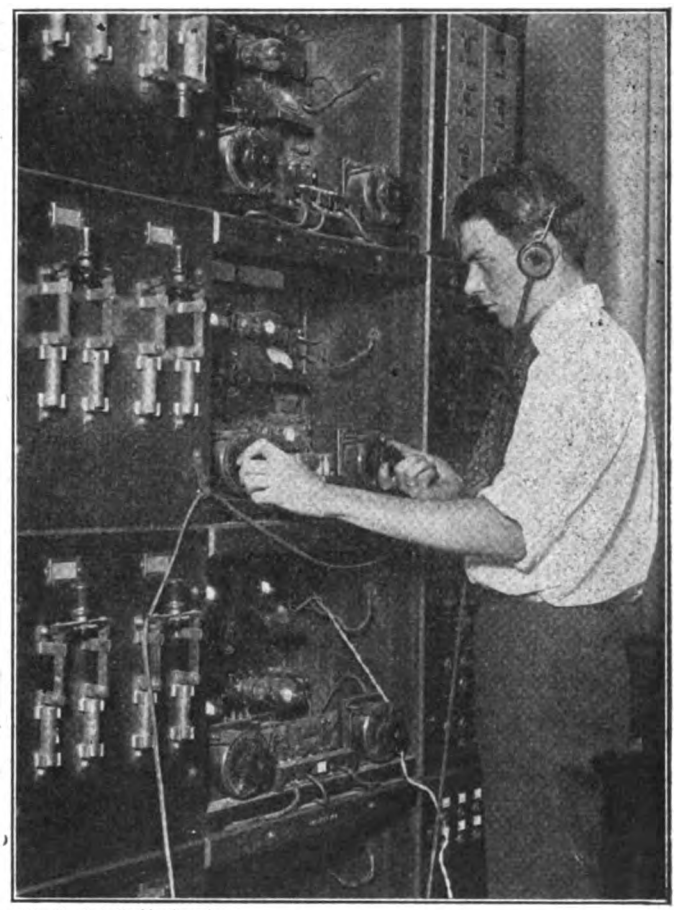
9. Ask your radio dealer for advice; he can probably tell you what you want to know, and will be glad to do so. The manufacturer of your set is also willing to help you get the desired results from its use.

10. Do not throw away the direction sheets or booklet that came with your set and with the tubes. Read all such material carefully now and then. If you have lost the direction sheet write to the dealer or manufacturer for another. The direction sheet must answer most of the questions which have been puzzling you and preventing you from getting the best out of your set.

Round Trip in Three Minutes

The picture below is a view in the New York sending station of the Radio Corporation of America. Messages are sent from here direct to London, Paris and Berlin through the control station at Rocky Point, Long Island. A high-speed duplex system is used on wave lengths from 10,000 to 20,000 meters. At the right is illustrated the receiving apparatus which catches the signals automatically relayed from Riverhead, Long Island, and transmits them to operators who decode them. A round trip from New York to London in three minutes is common.

(C. Kadel & Herbert)



(C. Kadel & Herbert)

Tipping You Off

WHERE a set is used that combines radio-frequency and tube detector, with either straight or regenerative qualities, it is much better to use separate A and B batteries than to combine the leads so as to get all the tubes feeding from one set of batteries. You will find you will not be bothered with broad tuning and the distance you will get will be increased.

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Naval Radio Development Centered at Bellevue, D. C.

By Carl H. Butman

WHAT is believed by experts of the Bureau of Engineering of the Navy to be a forward step in co-ordinating its research work, including radio development, at a single station was accomplished recently with the formal dedication of the Naval Research Laboratory at Bellevue, D. C., a short distance from the Capital.

Here are consolidated the Radio Research Laboratory formerly at the Bureau of Standards; the Aircraft Radio Laboratory, previously at the Anacostia Naval Air Station, old NOF; and the Sound Research Section of the engineering experiment station which was located at Annapolis. A group of buildings, just completed, on the shore of the Potomac south of Anacostia, comprise a power house, pattern, foundry and machine shops and the three-story laboratory building.

Radio Officers of the S. S. "Leviathan"

(C. Kadel & Herbert)

First photograph showing complete radio staff of the S. S. "Leviathan." Left to right are seen E. N. Pickerill, chief radio officer; A. C. Tamburino, first assistant radio officer; R. J. Green, second assistant radio officer; H. F. Bollendonk, third assistant radio officer; E. E. Engelder, fourth assistant radio officer; C. R. Underhill, fifth assistant radio officer.

The whole project is under the direction of Capt. E. L. Bennett, U. S. N., aide to Secretary Denby, in Washington, and at Bellevue is under the supervision of Cmdr. E. G. Oberlin, U. S. N. Dr. A. H. Taylor, formerly in charge of radio at Anacostia, is in direct charge of radio experiments, assisted by twenty technical and scientific aides and engineers All the work is of a more or less confidential nature and, it is understood, each of the employees took an oath of secrecy.

The entire third floor of the laboratory is devoted to radio and sound development. It is divided into 18 rooms averaging 17 by 25 feet. Radio work there includes the development of ideal transmitting and receiving apparatus suitable for different naval circuits, both afloat and ashore. Special work in the improvement of vacuum tubes, static elimination, amplifiers, high-speed sending and receiving apparatus, such as the teletype and printing telegraph, is being undertaken.

Problems to be studied will be limited to research in so far as they may be connected with applied science; in other words, this laboratory will not undertake purely scientific research as does the Bureau of Standards. Special problems relating to marine and military radio are studied and model sets constructed for manufacture by commercial firms. The new transmitting set for Arlington which is free from "mush and harmonics" was produced by naval radio experts at the old laboratory at Anacostia. Different styles of receivers and wave meters are also experimented with.

The work specifically covers the practical application of theoretical designs developed by Navy engineers and inventors. Modification of impractical designs is frequently necessary in the actual construction, it being the main object to equip naval vessels with the last word in radio. Sea-going specifications are far more severe than in ordinary land work, especially in radio equipment.

Bellevue has a receiving station but no transmitter, on account of possible interference. When messages must be sent out, however, a land line controls a radio transmitter at Anacostia. Every ship of the fleet does some testing in transmission on its own hook, but when necessary ships can be sent to the dock at Bellevue.

Much of the work has to do with the development of special radio apparatus for aircraft including the adaptation of the radio compass, the use of the teletype and other auxiliary apparatus. Although some tubes and batteries are tested at Bellevue, most of the preliminary work is done by the manufacturers themselves, the perfected tubes and batteries being submitted for final trial. Usually in the event a special set is desired, the engineers and laboratories construct it around the best tube available in the commercial market.

Broadcasting Station for Milton, N. Y.

RECOGNIZING the value of radio as a means of disseminating valuable information to the general public, A. Stone, the novelist, lecturer and philanthropist of Milton-on-the-Hudson, New York, and founder of the A. Stone Foundation, an organization that will devote itself toward the realization of worthy objects, is making preparations to establish a powerful radio broadcasting station upon his estate at Milton this fall. The station, which will probably be 15 kilowats, will be used for broadcasting lectures on important topics which will include science and literature. For this purpose Mr. Stone will enlist the services of nationally known lecturers while he himself will devote two hours each week to broadcasting talks on current literary topics.

Mr. Stone's place on the Hudson is an ideal location for the establishing of a broadcasting plant. Overlooking the river, the highest point is 700 feet above sea level.

Members of the Authors' League of America, of which Mr. Stone is a member, are watching the results of the experiment with a great deal of interest.

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Transoceanic Radio Telegraphy

By E. F. W. Alexanderson

Chief Engineer, Radio Corporation of America

THE radio engineer is, more than any other, compelled to work with conditions which are not within his control, and only partially understood. The law of probability and averages must therefore figure largely in his calculations.

A good many of those present here are undoubtedly radio amateurs. When you have received some clear signals from Kansas or Cuba this is an interesting fact and you relate it to your friends. Many of you are, no doubt, fond of fishing especially when you have caught a big trout. That is an event worth mentioning. These are single facts highly subject to the law of chance. Nevertheless the professional fishermen succeed in providing fish for our dinner tables with great regularity. It is the aim of the radio engineer to chart the sea of the ether, to weather its storms and to provide a continuous service of communication day and night.

The transoceanic radio station is a power station. Its input is kilowatts and its output is words. The problem of radio engineering is to establish the relation between kilowatts input and words output. This relation between kilowatts and words is a chain comprising four separate subjects which are being studied by specialists in those subjects. They are:

1. Relation between kilowatts consumed and wave energy radiated.
2. Relation between wave energy at the transmitting station and wave energy at the receiving station.
3. Relation between wave energy at the receiving station and the speed at which words can be received.
4. Influence of atmospheric disturbances.

The first subject deals with the radio power station and the antenna. The Radio Central antenna is designed from the ground up. It has six ground connections distributed over a distance of one mile and 150 miles of wire buried in the ground. Through these devices the ground resistance has been reduced to 1/10 ohm. The best antenna of types previously used have ground resistances of about two ohms. The losses in the ground have thus been reduced at the rate of 20 to 1.

The second subject is wave propagation. We have now a great deal of practical data which can be summed up in the rule that the most economical wave length for communication over a certain distance is about one five-hundredths of the distance.

The third subject deals with the design of the receiving station. It has been found that the speed in words per minute at which it is possible to receive telegraph code is directly proportional to the amplitude of the wave. A signal field strength of 50 microvolts per meter corresponds under average conditions to a speed of 50 words per minute.

The fourth subject deals with the atmospheric disturbances. Our modern receiving system eliminates about nine-tenths of the disturbance but the residual which is not eliminated determines the speed of reception by the law of inverse proportionality.

For elimination of disturbances we use a new type of antenna about ten miles long. It is a simple telegraph wire mounted on ordinary poles. It is not tuned for any particular frequency, and waves of all lengths travel along the wire with the velocity of light. The ether wave thus starts a wave on one end of the wire, and this wave travels along the wire while the original ether wave follows beside it in space, constantly adding energy to the wave on the wire, just as the wind starts a ripple at one shore of a lake and rolls it up to a large wave as it travels along. Thus the wave intensity in the wire grows and becomes a maximum at the far end of the wire. Fortunately on the Atlantic coast most of the disturbances come from the west, whereas the signals come from the east. The wave antenna thus separates the signal from the disturbance so that the signal appears at the east end of the wire and the disturbance at the west end. The energy of the disturbance is destroyed by absorption in a resistance at the west end of the wire, whereas a practically pure signal can be collected at the east end.

With the data that is thus available the planning of a new radio system is no longer a matter of guesswork. Before designing our South American system we sent an expedition of engineers to chart the atmospheric disturbances. Their findings led to a modification of the original plan because it was discovered that at the location first selected the principal disturbances came from the same direction as the signal, and therefore could not be eliminated. From the data now available it is possible to calculate the number of words that can be received during each month in the year, although the stations have not yet been built.

We can thus say that radio engineering has reached a point where sound foundations technically and financially can be laid for the expansion of this system of communication.

Abstract of a paper delivered before the American Institute of Electrical Engineers.

Latin-American Officers Learning Radio

(C. Underwood & Underwood)

This picture shows Lieutenant Salcedo, of the Peruvian Army (standing), and Captain Masvidal, of the Cuban Army, learning army radio operation at the R. O. T. C. Signal School, Camp Alfred Vail, N. J.

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Securing the Co-operation of the Amateur

By Kenneth M. Swezey

IN most every town and hamlet where there are at least a few amateurs, you are certain to find a radio club. Radio, more than any other popular avocation, seems to harbor such a powerful fraternal spirit that the average person has a hard time to dodge. That is, referring to the real dyed-in-the-wool amateur—the "ham." These clubs serve the purpose of bringing the members together for good fellowship, and more than that, they serve to disseminate a greater understanding of radio by the exchange of ideas, the conducting of classes and the making of group experiments. Many clubs have a very complete equipment of apparatus, both sending and receiving, along with facilities for theory instruction and code practice. And probably a goodly number of the members are experts, having at their command a proficiency above the average commercial man. Indeed, many of the members of clubs with whom the writer is acquainted hold first-grade commercial operators' licenses.

Ever since the inception of broadcasting on its present scale there has been a misunderstanding between the broadcast fans and the amateur. One continually flays the other without rhyme or reason—and simply because the existing conditions are not clearly understood. It seems that the broadcast fans have been doing most of the kicking, so I will take up the brief of the amateur, and try to show the fans the utter lack of antagonism on the amateur's part toward them.

The amateurs are not a bunch of kids whose only ambition is to disturb the ether, bust up the programs and all such nonsense. As was mentioned before, they are most of them well-trained mature fellows who are in the game for pleasure and development. During the past year they have voluntarily sacrificed a good portion of their rights for the sake of broadcasting. They resigned themselves to the very late hours of the night so that the concerts could go on undisturbed, when really they were not the disturbing factors at all, but the poor tuning ability of a large percentage of the receiving sets. The amateur wave length band is sufficiently distant from the broadcast band to enable all good sets to tune them out completely. So, after all, the amateur is not such a bad fellow.

To convince himself that what I have said is true, the best thing the broadcast fan could do is to visit one of the clubs and perhaps join it. Lists and announcements of their doings can be found in this or most any other radio magazine. You will have an interesting time and you will find the "hams" very willing to co-operate in anything pertaining to their hobby. If you have anything the matter with your set, take it along with you, and let them have a hand at trying to diagnose its ailment; it's great sport to them, and each will try to show his superior knowledge. The harder and more knotty the problem, the better it is.

It is very probable that the vast broadcasting audience would advance a long stride if they would take advantage of the service that the amateurs offer them. The ignorance that now exists would soon fade away in the light of proper instruction. There would be less worthless apparatus sold and fewer good sets ruined by lack of operating knowledge. And the amateur would be able to take a step forward because of the increased membership in the ranks and the increased capital resulting therefrom.

Just what has the club to offer the fan? Well, I will use for an example a representative club in which I have a membership. First of all, it offers to increase your friendship circle by about twenty good old scouts; that's a point not to be overlooked. And they are truly real good fellows—except that they will talk you deaf, dumb and blind about radio and nothing else. Next, it offers a person sound theory instruction on the subject. By the aid of good instructors, blackboard talks and practical demonstrations they can pump enough "dope" into your head in an evening to swell it beyond the hatband limits. Besides the regular theory, the members bring their individual problems, new hook-ups, and such things, to be discussed.

If you want code instruction, here is where you can get it, and first class stuff at that. This particular club had code tables arranged for different speeds, and had the option of either hand sending or sending with an omnigraph. I know of at least eight fellows, who joined the club with a very slight knowledge of radio, and in a few months had successfully taken their first grade amateur license examination.

The club also offers social features that are worth while. Every month or so they set aside for a festive occasion, when they have a great time with the games and their "eats." When it comes to filling the stomach, the non-technical fan can put up as good a showing as his fraternal brother, the ham.

Everything considered, the getting together of the hams and the fans would be mighty beneficial. For one thing it would instill a respect in the mind of the fan for the amateur; and the amateur might think a whole lot more of his fan brother if he knew him just a little better—just enough to realize him as human. A lot of receiving set owners would get to understand their apparatus better, and there would be less cheated and disappointed souls. And as a result of this, a great strain would be taken off the newspaper and mazagine question and answer departments. Thus more time would be given the editors to produce better goods. And the fan and the amateur will exclaim in unison, "This is Heaven! Where do we go from here?"

Where to Look for Trouble

IF you hear a constant clicking noise, like the dropping of water on a hot stove, vary your grid leak and watch your grid condenser.

If there is a steady sound like a motor running, look around for a loose or broken connection.

If your tube vibrates when the set is operated mount the socket on felt or soft rubber.

If there is a crackling sound when the coupling is increased, decrease your filament current.

If the signals stop and go and the set is functioning properly, inspect your antenna. It is probably swinging and grounding periodically.

If your set howls when you are tuning, or the signals fade when you take your hand from the controls, shield your panel and ground the shielding.

If your set will not oscillate, reverse the plate and phone leads of your tickler.

If signals are weak, look for dirt and dust inside.

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A Radio-Frequency Push-Pull Amplifier Using a Crystal Detector

By J. E. Anderson, M. A.

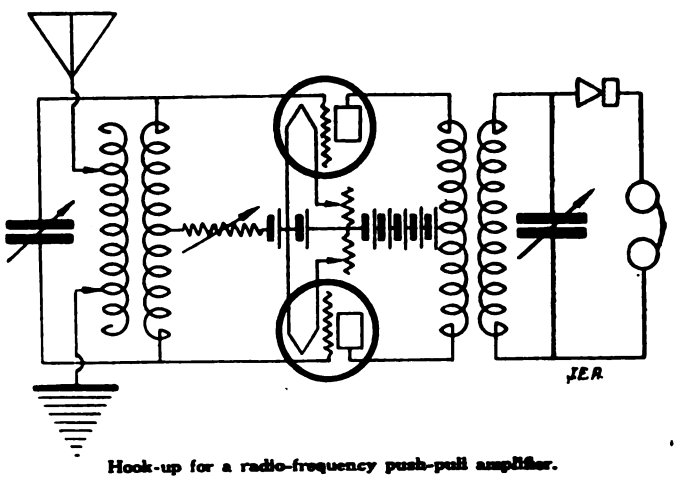
THE push-pull circuit for the amplification of audio-frequency currents is well known in radio circles, but it has not gained the popularity that it deserves on account of the difficulty of obtaining the necessary transformers. Only a few manufacturers have placed these coils on the market and the number of dealers handling them is very limited. It is to be hoped that this condition will soon be remedied, and that the coils may be procured at a price that is commensurate with the pocketbook of the average amateur, so that all who desire may avail themselves of the advantages of this circuit. In the meantime, however, we may apply the same principle to a radio-frequency push-pull amplifier and thus retain some of the advantages of the balanced circuit. This may be done at an expense no greater than that of an ordinary radio-frequency amplifier since the necessary coils may be constructed at home.

The accompanying diagram illustrates one method of connecting a push-pull radio-frequency amplifier, using a crystal detector to render the signals audible. In this circuit double tuning is used on the input side of the tubes and the output circuits are tuned indirectly through tuning of the secondary of the output oscillation transformer. The middle point of the grid coil is connected to the negative end of filaments through the common "C" battery and a variable resistance. The positive side of the common "B" battery is connected to the middle point of the plate coil and the negative side of the "B" battery is connected to the positive side of the "A" battery.

This circuit may be used without any connection between the middle point of the grid coil and the negative end of the filaments with fair results, but the grids will then be "floating" and there will be no definite grid potential with respect to the filament. If the proper negative biasing battery is inserted between these points the circuit is liable to oscillate vigorously and no signals will be heard. But the oscillations may be stopped by inserting a resistance in series with the battery as is shown in the diagram. The amount of this resistance necessary depends on so many conditions that it cannot be stated; it must be found experimentally for each circuit, and for this reason the resistance should be variable. Sometimes the circuit will not oscillate when the resistance is zero and at other times several thousand ohms will be required to stop oscillations. The tendency of the circuit to oscillate depends on the various characteristics of the tubes, the inductance of the grid and plate coils, the degree of coupling in the two oscillation transformers, and on the degree of unbalance of the two tubes.

The most important consideration in this circuit is to obtain as nearly perfect electrical balance as possible. The two tubes should be alike in all their characteristics and they should be carefully adjusted to operate over the corresponding parts of their characteristic curves. This may be done by adjusting the "C" and "B" potentials separately, but it is more convenient to use common batteries and adjust any small unbalance in the circuit by adjusting the temperatures of the filaments. The use of small compensating batteries would merely introduce complications. The adjustment for electrical symmetry may be facilitated by maintaining physical symmetry in constructing the circuit. This would automatically balance out any stray electro-magnetic or electrostatic effects. If the input impedances of the two tubes are different, the effective input potentials will not be the same, even if the electromotive forces induced in the two halves of the grid coil are the same, and the resulting currents in the two plate circuits will not be equal. This may be corrected by connecting the common grid return lead to a point to one side of the middle. This, however, is not recommended. Similarly, if the output impedances of two tubes are different, the output currents will be different, even if the effective input potentials are the same.

The best way of testing the circuit for unbalance is to insert a small coil in series with the "B" battery and to couple a detector circuit to this coil. If the circuit



Hook-up for a radio-frequency push-pull amplifier.

is perfectly balanced there will be no sound in the telephone in this detector circuit. This condition cannot be attained ordinarily in a practical circuit, but it may be approached closely by adjusting the circuit until the sound is a minimum. It will not do to insert a telephone directly in series with the "B" battery in order to test for unbalance. This would merely show whether one tube is a better detector or rectifier than the other, and would not show their balance as amplifiers.

The variable resistance in the grid circuit may be used to control regeneration as well as the oscillations, provided it is capable of variation in small steps or of continuous variation. If it is desired to use a tickler to obtain regeneration for long wave lengths, this should be inserted in series with the secondary of the output oscillation transformer and placed in inductive relation with the grid coil.

Since only one-half of the grid coil is in each grid circuit, this coil should be larger than is usual in order to get a high potential on each grid. If an 11-plate variable condenser is available the coil should have an inductance of about 400 microhenries. If a 23-plate condenser is used the inductance should be about 200 microhenries. The first combination is preferred.

(*Concluded on next page*)

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Auxiliary Radio Equipment Saves Passengers

AN example of the value of auxiliary radio power in the form of batteries on seagoing vassels and the necessity of their frequent inspection, is found in the report on the total loss of the S. S. "Advance."

When the "Advance" went aground off Halifax recently, the operator found that his power was cut off soon after grounding, as it was feared there might be a boiler explosion. This made it necessary for him to shift to his emergency batteries for transmitting SOS calls to ships and shore stations. His batteries stood up one-and-a-half hours, when it became necessary to abandon ship. All lives were saved, though the vessel itself was lost, due to the bringing of aid by radio.

There would undoubtedly have been a loss of life if the batteries had not been in good shape, and it is understood that just before the vessel cleared from Boston for Halifax, a government radio inspector discovered that the old batteries were in very bad shape and condemned them. The owners immediately installed an entirely new unit of battery power supply, which insured radio communication when the regular power failed.

The Radio Woman

WHY don't more of you ladies sit down once in a while and write me your experiences or troubles or joys of the redoubtable radio set? It's really an easy thing to do, sisters, and you'd be surprised how delighted some of my readers are at seeing their literary efforts in print. The next time you have a spare minute or two think of me and tell me something about that set you are all enjoying so much. Just write as you talk—our editors will polish up your efforts.

* * *

The other night, when they were giving out the returns of the Leonard-Tendler fight, I unfortunately had an appointment and could not remain at home with my men folks who were waiting for the returns. I passed about four radio shops and at each one the same condition existed—a mob of men and women, mostly men, of course, were gathered about the store and way out into the gutter intently listening to the reports of the rounds. I was just thinking how much more comfortable my little brood was at home with iced tea to sip, cozy lounging chairs, and no crowding. If some of these men could see the picture in my mind, they would undoubtedly walk into one of those stores instead of remaining outside, and purchase the best set they could afford.

* * *

I told F. H. of the conditions existing on the outside and he said, "Well, my dear, we can't all be prosperous and some have to be on the outside or the inside will be crowded, too."

* * *

One of my little boy friends, a high school senior, is working during his summer vacation for the first time. He could have gone to the country with his mother and younger brother this year as usual but preferred to remain in the city with his dad this year. He is earning twelve dollars a week at a place quite near his home, which means no outlay for carfares or lunches and allows him to keep his salary. His intention is to work for seven weeks, save up $84.00 or thereabouts, and buy a beautiful radio set when the winter is here. His parents wisely refused to lay out the money—hence his sudden burst of worthy ambition.

New Broadcasters Licensed

EIGHT new broadcasting stations of the A Class and one in Class B were licensed during the past week by the Department of Commerce. Four stations in Class C were transferred to Class A and one to Class B.

New Class A

Call	Station	Frequency Kcys.	Wave Length, Meters	Power, Watts
KFIY	Brott Laboratories, Seattle, Wash..	1,270	236	15
WSAU	Camp Marienfield, Chesham, N. H.	1,310	229	10
WSAW	Curtice & McElwee, Canandaigua, N. Y.	1,090	275	100
KFIZ	Daily Commonwealth, Fond du Lac, Wis.	1,100	273	100
KFJI	Liberty Theatre, Astoria, Ore.....	1,190	252	10
KFJF	National Radio Mfg. Co., Oklahoma City, Okla.....	1,190	252	20
KFJC	Post-Intelligencer, Seattle, Wash..	1,290	233	100
KFJH	The Sugar Bowl, Selma, Cal.....	1,100	273	10

New Class B

WRC	Radio Corporation of America, Washington, D. C.....	640	469	500

Transferred from Class C to Class A

WWL	Loyola University, New Orleans, La.	1,070	280	100
KFCZ	Omaha Central High School, Omaha, Neb.	1,160	258	100
WLAN	Putnam Hardware Co., Houlton, Me.	1,060	283	250
WRAD	Taylor Radio Shop, Marion, Kan..	1,210	248	10

Transferred from Class C to Class B

KDZE	Rhodes Co., The, Seattle, Wash...	660	455	500

(*Concluded from preceding page*)

From 60 to 70 turns on a 3.5" tube will give an inductance of about 400 microhenries. The plate coil may be somewhat smaller than this. The magnitude of the secondary in the output oscillation transformer is not important. A 43-plate condenser with a coil of 100 microhenries may be used, or a 23-plate condenser with a coil of 200 microhenries. The antenna coil should be capable of variation in steps of a single turn.

This circuit may also be used as a single circuit tuner by connecting the grid leads directly across the antenna coil and the common grid return lead to the middle point. When this is done an antenna condenser must be used to tune the circuit. If any changes are made in the antenna inductance they must be made symmetrically with the common middle point. Another variation in this circuit may be made by eliminating the secondary of the output oscillation transformer and connecting the tuning condenser and the crystal-telephone branch directly across the plate inductance coil. This would simplify the circuit but it would render it less selective.

The circuit described here operates as a radio-frequency amplifier, and therefore only hard tubes should be used. These are not so critical and not so difficult to balance as the detector tubes.

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

BXZ has been assigned as a general signal call to all British war vessels.

* * *

The coast station at Puno, Guyas, Ecuador, is now open to PG service.

* * *

Amateur radio again proved its value when long distance messages were handled during the recent telephone strike in New England cities.

* * *

The Director of Telegraphs of Venezuela has announced that bids will be asked for the erection of a new high-power radio station at Caracas in the near future.

* * *

Commander R. R. Mann, U. S. N., has relieved Commander J. J. London, U. S. N., as superintendent of Atlantic Coast Naval Communications. He is in charge of both radio and land line circuits.

* * *

Powell Crosley, Jr., president of the Crosley Manufacturing Company and the Precision Equipment Company, Cincinnati, is taking a special radio set with him on his vacation to the wild camping district of the north. He will make some special tests with this equipment.

* * *

The radio baby carriage man has appeared at Forest Hills Gardens, Long Island. He trundles a loop set in a perambulator up and down the residence streets prepared to give an instantaneous demonstration—in fact, the set is sometimes talking when he pulls up to the front door.

* * *

Radio returns of the Dempsey-Gibbons fight, crop reports and bedtime stories filled idle minutes under the big gas bag which carried him to victory in the national elimination balloon race last week, Lieut. Robert S. Olmstead, pilot of the army balloon S-6, said on his return to his post at Middleton. Olmstead and is aide, Lieut. John Shottow of Chanute Field, Ilinois, were over Lake Erie when they began to pick up the broadcast programs.

* * *

Radio service on the Great Lakes formerly handled by the Naval Radio Service has been taken over by the Intercity Radio Company, which has established stations at Cleveland, Detroit and Chicago. Other stations will be opened shortly in all the important lake cities. Ordinary telegraph service between the cities also will be handled. The new installations will operate on 1,800 meters with call letters WTK for the Cleveland station. The station will operate continuously.

Radio service for each of its 1,215 guest rooms will be one of the novel features of the thirty-story Book-Cadillac Hotel, under construction at Detroit, Mich.

* * *

The French Cabinet, on Premier Poincare's demand, has passed a special decree establishing control of the material for radio broadcasting. The decree was presented to President Millerand for signature. The measure forbids the use of radio for anything except Government announcements, ministerial speeches or other matter specifically permitted by the Ministry of Posts and Telegraphs.

Music Radioed From Ship to Shore

(C. Kadel & Herbert)

This is the equipment to be used in broadcasting music from the new S. S. "Albert Ballin's" orchestra as soon as a permit is obtained. Both panels on the wall contain speech amplifiers, which will amplify the music picked up by the microphones. The music will then enter the transmitter to be broadcast to thousands of listeners on shore. Chief Operator William M. Hannemann at the microphone.

RADIO PRIMER

CARE OF THE STORAGE BATTERY IN SUMMER: During the summer months the radio set does not get as much use as it normally would, partly due to the fact that portable sets are used, and also partly due to the fact that the set is not used as much, if it is used at all during the real hot weather.

When you start in the fall, if certain precautions are not used you will be surprised to find that your battery is rapidly deteriorating. Where the battery stands idle, it should always be kept under full charge, regardless of whether it is used or not.

This is because the chemical action that takes place in a storage battery is slowly going on all the time, and if the battery is not kept charged you will find that your battery has "gone dead" on you, or worse yet, the plates will be sulphated (covered with a scaly powdered white coating) and will have to be thrown away. In view of this therefore, always take the precaution to charge it every month.

Another and equally important point in the scheme of things is the fact that the solution should be kept above the tops of the plates. During the warm weather, there is naturally more evaporation than would normally take place in the colder months. Use only distilled water and put enough in the cells every two weeks to keep the plates covered.

Keeping the battery dust proof is also a very good idea. Sulphuric acid has a very bad habit of "creeping." If some is allowed to gather on the composition filler covering the battery you will soon find that it covers the entire top of the battery, creeping to the wood and destroying it.

It is always good practice to cover the terminals and lead strips and all metal parts, such as the lugs that connect the leads of the filament circuit to the battery, with a light coating of vaseline. This is a precaution that will save much time and trouble when you start to use the set later on. If this is not done, you will have trouble with corroded joints, as the fumes of the acid will work havoc with metal if it is not properly protected.

A battery is almost like a human being in some respects. At least once a year you should take the battery to some service station and have it looked over and cleaned out. A lot of sediment generally collects at the bottom of the jars, due to the acid working on the wooden separators and other parts. If this deposit is allowed to stay, it will short circuit the plates and seriously harm the working of the battery.

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The Vacuum Tube as An Amplifier

By C. White, Consulting Engineer

IN a previous article I endeavored to explain the difference between the vacuum tube when it was employed as a detector and when employed as an amplifier. For a brief summary, the determining factor was the particular characteristic we were working the tube on that would decide whether the action were that of a detector or an amplifier. Then again, when a tube was to be used as a detector it must have a rectifying quality which is not at all present when the tube is to be used as an amplifier. You will also note from the previous article that when a tube is used as a rectifier it is only the positive impulses that are passed on to the plate circuit, and also that when the grid is positive there is a small current flowing on the grid circuit. This is the reason that a grid leak resistance is used in the grid circuit of a detector tube to regulate the resistance of the leakage path of this current, or of the positive charges on the grid, if you so desire to think of the action in terms of charges. But when the tube is acting in capacity as an amplifier, negative as well as positive impulses must be passed on amplified to the plate circuit, otherwise serious signal distortion would result, to say the least. The grid current, though only appearing on the positive impulses of the grid voltage, would not at all be beneficial since it would flow through the secondary of the amplifying transformer, thus causing the core to be demagnetized, thereby cutting down the volume. To overcome this tendency of the grid to become positive at times it is customary to connect the grid return wire to the negative leg or side of the filament "A" battery. This action causes the grid to be biased with a negative potential which does the same thing graphically as shifting the grid variations from the dotted line position, as shown in Fig. 1, to the solid line position. It means that the grid will remain negative at all variations of the grid potential, unless the positive throw of the grid alternation is greater than the negative bias, and under such circumstances an additional negative potential bias must be obtained from a "C" battery as illustrated in Fig. 2. If, perchance, a high "B" or plate battery voltage is employed the grid will have a strong tendency to become positive at certain times, or when amplifying certain notes. This means that there will be a grid current for those particular notes and no grid current for all the others—hence distortion will be present. To prevent this a "C" battery is used when high plate voltages are used. The advantage of the latter is that the amount of amplification is greatly increased with an increase in plate voltage provided we keep the grid negative at all times and we do not overload any part of the circuit.

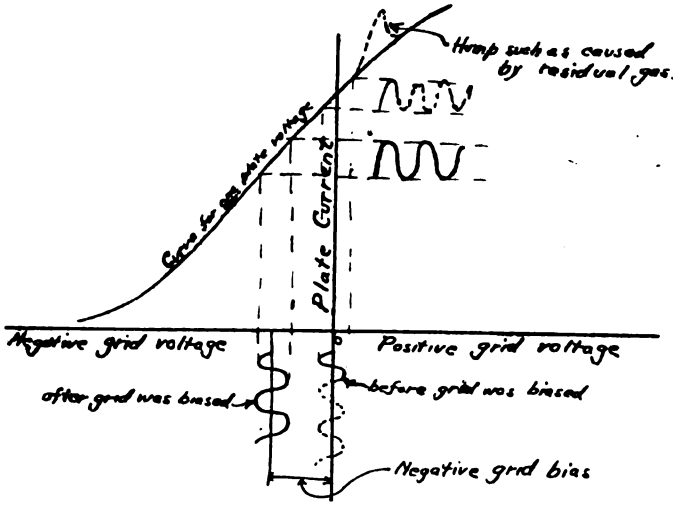

Fig. 1—Results of laboratory tests on a soft tube.

The old question as to why a soft tube makes a good detector and a poor amplifier arises. A soft tube is one in which a small amount of residual gas still remains. When the filament is heated there is an electron emission from the material of the filament itself and another entirely separate electron action caused by the residual gas. The action is quite analogous to boiling a pot of fluid that contains ether and water. Of course, you would expect that the ether would boil off at a different temperature than the water. The same is true of the gas in the tube. The combination of the two actions makes the tube very erratic or "sensitive," which fact is easily seen in a laboratory test of a given tube by a hump or lump appearing on the characteristic, as shown by the dotted line on the curve in Fig. 1. A lumpy curve is no more desirable for amplification than a rough road is for motoring. Strange to say, the lumps do come in handy when a tube is to be used as a detector, but do not be mislead into the belief that only a soft tube will act satisfactorily as a detector. This fact, though very common a year ago, is now falling into the background because experience has shown that a hard tube will often do the job just as well and in some cases better than a soft.

There is always a bridge from the theoretical side to the practical. Remember that I said that when the grid was negative that no grid current flowed. This fact is not entirely true for at all times there is a very small grid current, although it is to be conceded that the amount flowing when the grid is positive is many times larger. Then again, experience has taught that a constant input impedance for an amplifying circuit is very desirable; hence the practice of placing a variable grid leak across the secondary of the amplifying transformer in order to provide a constant input impedance once it is adjusted to the correct value. If the secondary is left open the input impedance can vary anywhere from a known value to infinite value, depending upon the insulation resistance and other constants of the circuit. With some transformers you will find that a grid leak in the position as indicated in Fig. 2 certainly takes a lot of noises and crackling out of the signal without cutting down amplification to a marked degree. If you now have an amplifier and it is very noisy try a grid leak across the secondary and a "C" battery. Try reversing the secondary terminal connections to the transformer and note the difference Little tricks will often enable you to locate trouble as well as improve your outfit.

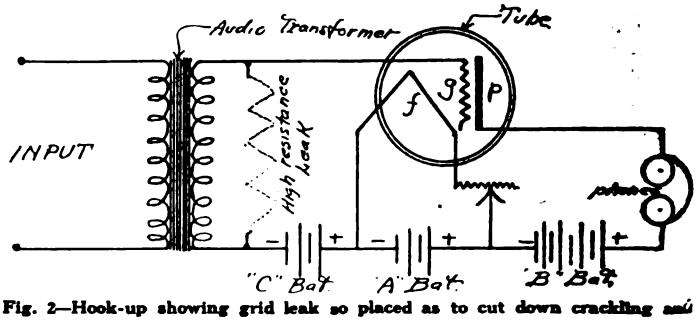

Fig. 2—Hook-up showing grid leak so placed as to cut down crackling and other noises.

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Second Convention of Radio Amateurs Meets in Chicago, September 12-15

CHICAGO, ILL.—All "Hamdom" will meet in Chicago!

The largest gathering of radio amateurs in history is scheduled for this city September 12 to 15, when the Second National A. R. R. L. Convention will be held here under the auspices of the Chicago Radio Traffic Association with headquarters at 959 Rookery This was announced last week following receipt of information that Chicago had been selected as the scene of the convention by the American Radio Relay League Board of Direction at a meeting in New York City.

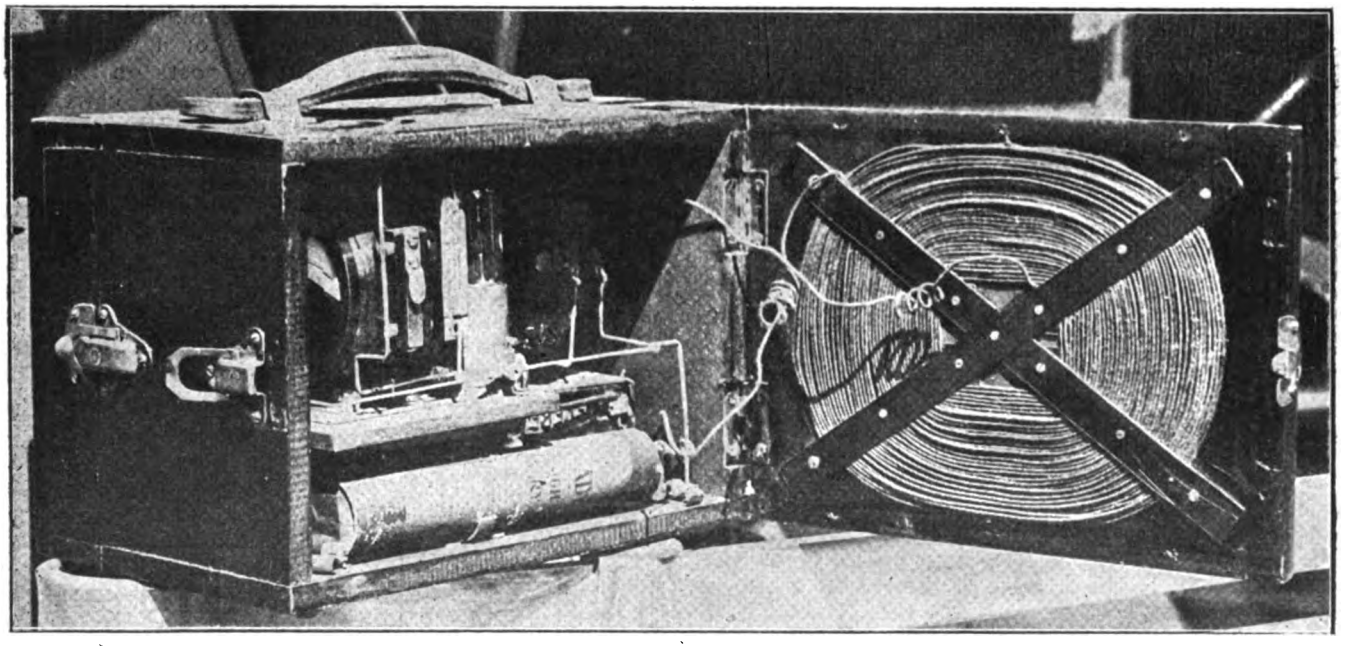
DX fans all over the country and Canada, from New York to the Golden Gate and Ontario to the Gulf, many of whom communicate with each other nightly over thousands of miles through the A. R. R. L. relay system and who know each other best by their call letters, will here meet face to face for a discussion of their special problems.

There has been but one other such convention, held here in 1921, and the tremendous strides in amateur radio since that time and with it the growth of the amateurs' representative body, the A. R. R. L., will make the coming event one of great moment to all amateurs and to the radio public in general.

Since that first meeting amateurs using low power have sent their signals across the Atlantic and Pacific Oceans, their transmitters have worked stations in Australia and New Zealand and their calls have been heard in South America and Africa. One of their number is now radio operator on Captain Donald B. MacMillan's schooner "Bowdoin" bound for exploration in the Arctic.

With their transmitting stations reducing the size of the globe month by month, amateur interest is running high and the coming convention will carry this spirit of progress in review.

A Light Weight Portable Receiver for Automobile Use



This picture shows an interior view of a new auto portable receiver built by L. J. Miller, of Brooklyn, N. Y. The set weighs nine pounds and is complete with batteries and head phones. It operates on a 7x10-inch loop incorporated in the set. It will receive up to 25 miles in the city and 50 miles in the country.

Condenser Substitute

SOME time during the operation of your transmitter you have had the hard luck of blowing a condenser, just when you needed your transmitter most. No doubt you sat there and made the surrounding air a deep navy with your remarks.

The next time it happens (we don't wish it on you, but accidents are liable to happen) don't cuss. Simply get a mason jar and a test tube, or smaller jar which will fit inside of it, and fill both three-quarters full of salt water. Immerse two leads in both jars, and you have a condenser. It is a makeshift at best, but it has saved many a futile hour hunting for a glass plate to mend the old one.

Are You Undecided?

MANY times the fan sees a circuit that he wishes to try, or wants to build a set and doesn't know which type to tackle. Will it be a triple circuit, double circuit, single circuit or reflex? If he has no experience in set building, the last one that he ought to tackle from a practical standpoint is the reflex. But if he is looking for selectivity, he ought to give the triple circuit sets careful consideration. If he wants volume he should tackle some simple single circuit, but first give a thought to the neighbors, because most single circuits can cause more ruction in a neighborhood than a mouse at a "sewing circle."

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A Crystal Receiver and Wave Meter Combined

By Kenneth Malcolm, A. I. R. E.

A WAVE meter serves the purpose which its name implies—it measures waves. Not long ago the writer was asked how anyone knew that a station had a wave length of so many meters, since the waves themselves were imperceptible to any of the senses, and they could not be measured with a rule, as visible material things could be measured. We cannot see amperes or volts or watts, yet we can measure them very accurately with instruments that are made for the purpose—and radio waves can be measured in the same way by instruments.

The length of a radio wave depends upon its frequency, and the frequency of a wave depends upon the product of the inductance and the capacity in the circuit. By knowing the inductance and the capacity of the circuit we know the frequency, and by knowing the speed at which the waves travel, we can easily calculate the wave length—simply by dividing the speed by the frequency. The waves travel through the

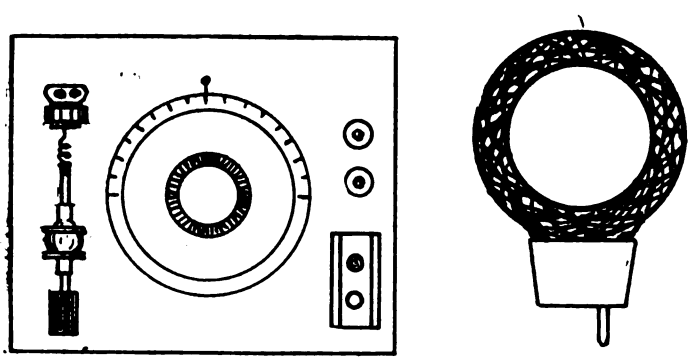

Fig. 1. Panel layout and coil for a crystal receiver and wave meter combined.

ether at the speed of light, or 300,000,000 meters a second. If we have the circuit constants of such a value that they will give a frequency of 500,000 waves a second, the process of simple division gives us the figure 600, which is the length in meters of a single wave.

To simplify the process of calculation, an inductance coil of known value is incorporated in a circuit with a variable condenser, and the combination is calibrated from standards and called a wave meter. Some of these instruments read directly in meters, while others must be used in connection with a calibration chart, which gives the meter values for the different scale readings of the condenser.

It is not absolutely necessary to have a wave meter when you have only a receiving set, but its use would prove interesting, as well as aiding in the calibration of the set and in tuning.

The meter to be described can be made quite easily and at a very moderate cost, and besides being a measure for wave lengths, it may be used as a very fine crystal receiver for use with a large loop; a loop such as described a short time ago in this magazine.

The necessary parts are few and include: a good variable condenser of .0005 mfd. capacity; the parts for a crystal detector; four binding posts; a pair of phones; a phone condenser of a capacity of about .002 or .003 mfd.; a DL coil plug socket; a DL-35 honeycomb coil; an insulating panel 3/16-inch thick, seven inches long and six inches wide; and a box of a size to fit the panel and about four inches deep.

Too much stress cannot be laid on securing good parts—those whose constants will not easily change with weather conditions and with handling. The condenser should be of solid construction, with heavy plates that are held firmly in position and well spaced. The DL coil should be perfect, with no loose wires and with the plug well secured. The detector may be of most any type, but the one illustrated is convenient and will give good service. The parts may be bought for very little, or they may be demounted from a mounted detector. The box should be of hard wood, and of a depth sufficient to take the particular condenser which you are able to get.

With all the parts at hand, you can start to lay out the panel for drilling. The arrangement shown in the drawing is very good, both for accessibility of instruments and making short and direct connections. If you wish to use the instrument solely for a wave meter, you may omit the pair of binding posts on the right hand side next to the plug socket, for these were designed to admit the outfit being used as a receiving set with a loop, or connected in the secondary of a loose coupler.

After all the holes have been drilled, the apparatus may be assembled. Then comes the wiring. Use heavy wire for this—say, No. 18 or 14—and make the connections direct, and solder them all. The circuit for the meter is shown as the circuit in Fig. 2, in which the inductance A is included. The two right hand binding posts are connected in parallel to the plug socket. The lower pair of posts are for the phones.

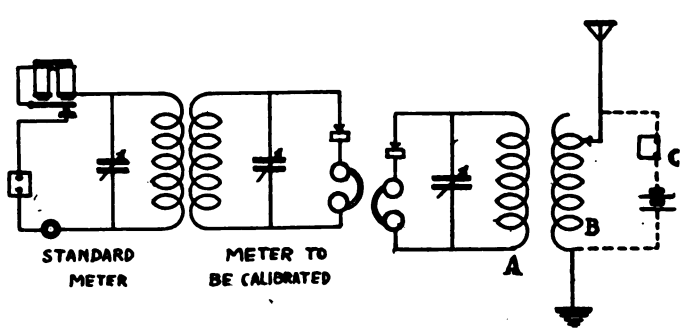

Fig. 2. Arrangement of apparatus for measuring incoming waves. Fig. 3 (at the right). Method of calibrating instrument from a standard.

When this has been done, your wave meter is complete, except for the calibration. This may be done with the aid of a standard wave meter, or, at least partly, by the assistance of the standard waves that are sent out periodically by the government. The former mentioned method is the easiest and the most satisfactory, and will be described. The standard wave meter should have a buzzer exciter, and the two meters should be placed in the relationship to each other as shown. That is, the coils of the two meters should be in inductive relation to each other. The exact degree of coupling can only be determined by experiment, but it should not be any greater than is necessary for

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good audibility, for the looser the coupling, the greater the accuracy that may be obtained.

To begin the calibration, set the standard meter at some arbitrary wave length, such as 250 meters. Start the buzzer going, and adjust the detector of the meter to be calibrated. Then vary the condenser until the maximum response is heard in the phones. This point is the point of resonance, and the degree on the scale of your condenser should be noted on a piece of paper, beside the wave length; such as 250 meters, 30 degrees. Go through this operation with a number of other wave lengths, marking down each one on the paper. Try about 10 points. Also determine the maximum and minimum wave length that is possible with your particular coil and condenser. If a higher wave length is desired than is obtainable with your DL-35 coil, use a larger coil, and make a separate calibration list for this coil. It might be here mentioned, that after a particular coil has been calibrated in connection with the wave meter, it should always be used, and not changed for another of supposedly the same inductance value, for a very slight difference in the coils will make a considerable change in the accuracy of the meter.

When you have secured the scale readings for about ten wave lengths, you can make a *calibration curve* on a sheet of cross-section paper. This paper you may buy in any store where draftsmen's materials are sold; or can make it yourself, by ruling horizontal and vertical lines on a sheet of paper, forming a large number of squares, somewhat as shown in the sample in Fig. 4. The curve is made by first dividing the horizontal lines as scale readings on the condenser and the vertical lines as wave length readings. Now, at the intersections, mark dots, for each of the test readings that were taken. For instance, the scale at 20 gave a meter reading of 175—mark a dot at the intersection of the vertical line 20 and the horizontal line 175. The scale at 70 gave a reading of 450 meters—mark a dot at this intersection. And do the same with the other readings, as shown. Then, when this is done, draw a line connecting all these dots. This will give you at a glance the wave length for any scale reading on your condenser.

Next comes the practical use of the meter, in measuring waves. Fig. 2 shows how the apparatus should be arranged to measure the wave length of a wave that is coming in through the aerial. In this instance the apparatus connected by the dotted lines is not used. B is the primary of your coupler, and A is the wave meter coil. Get these in inductive relation to each other, tune your set in the regular way, and then adjust the wave meter for maximum response. The maximum audibility point indicates resonance, and by checking up your dial reading with your calibration chart you can tell the wave length.

The value of knowing the exact wave length cannot be overestimated, for with this knowledge the receiving set can also be calibrated; which means that tuning comes out of the realm of guess-work and becomes exact. To calibrate your set, you have simply to tune in a station, ascertain its exact wave length, and either mark the dials, or else mark their relative positions on a sheet of paper, or in a little book for future reference. Or, instead of tuning in a station, you may connect a buzzer and battery across your primary coil, as shown by the dotted lines in Fig. 2; then set your wave meter at some arbitrary wave length, and adjust the coupler primary switch until maximum response is obtained. When the primary is adjusted to resonance, the other circuits may be tuned to it, the buzzer still going.

The wave meter shows its real value in tuning a transmitting set, for here we more than have a wave of an exact length. The process that must be gone through is identical with that of tuning a receiving set, except that the power is supplied to the set from a small spark coil, a transformer, or a vacuum tube, instead of incoming signals. For best results, each circuit should be tuned separately, and then finally both together. First, the closed circuit is tuned with the secondary, or open circuit, out of inductive relation. Then the open circuit is tuned, without being coupled to the closed circuit. Finally the normal coupling is used, and the circuits slightly readjusted as required.

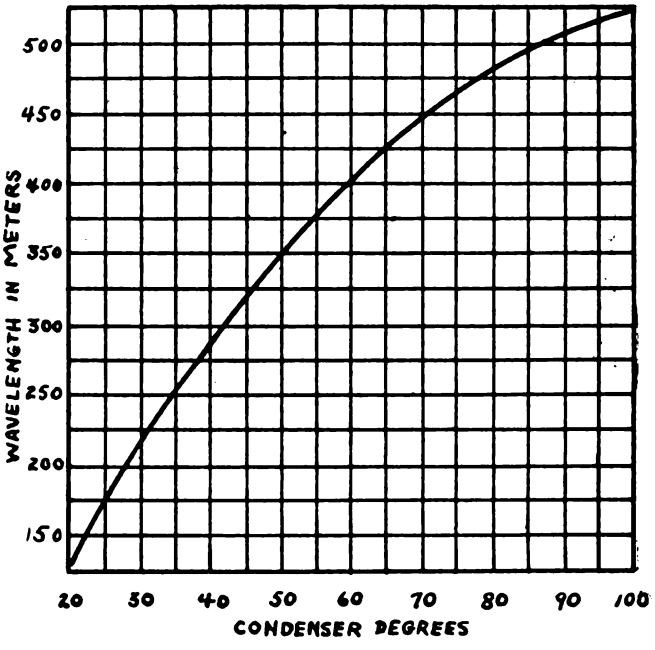

Fig. 4. Specimen calibration curve.

Texas Amateur Station Makes Record

HARTFORD, CONN.—Relaying of private messages by amateur radio telegraph stations of the American Radio Relay League is holding up well during the summer. The report of F. H. Schnell, traffic manager, shows a total of 34,648 messages handled during June by North American amateurs. The messages handled by spark transmitters were only six per cent. as compared with 94 per cent. using continuous wave.

Despite the tremendous amount of static which prevails in the Gulf states at this season, the best individual record was made by Roy S. Lay, operator of official A. R. R. L. relay station 5TM, at 110 Hubbard St., Yoakum, Texas.

Have You Made Sure?

DO you understand the polarity of your phones? Phones always work best when a definite lead is connected to the positive side of the B battery. If you do not know, ask someone who does and note the difference. The same applies to loud speakers, especially the ones that do not need a field battery.

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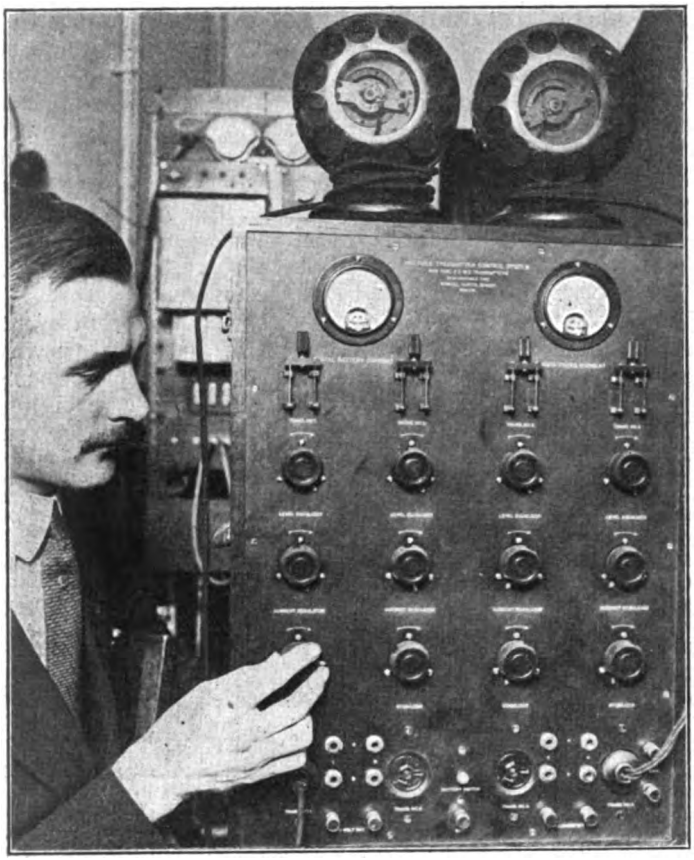
It's Wonderful the Way Radio Pe



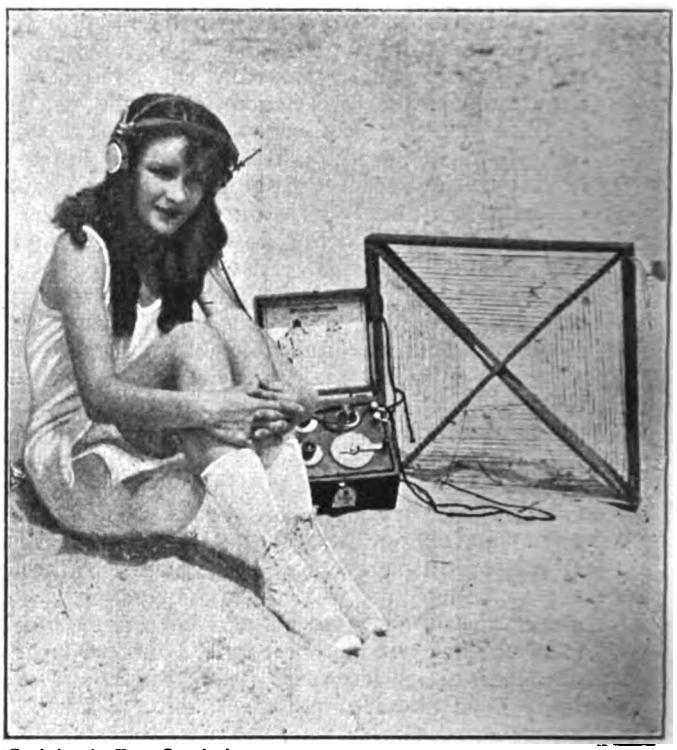
(C. Kadel & Herbert)

Station WNAC of the Shepard Stores at Boston, has developed a system whereby organ music, band concerts, etc., can be broadcast with all tones preserved intact. Most of the low tones of a pipe organ or orchestra are lost when broadcast by radio, but by means of this device four microphones can be used simultaneously to pick up the music. The picture shows Chief Operator Samuel Curtis who contrived the device.

Captions by Robert L. Dougherty

(C. Joel Feder)

A charming interior with the radio set artistically arranged. Mother and daughter are apparently enjoying a program which interests and pleases. The set is equipped with the Sleeper "Monotrol."



(C. Atlantic Foto Service)

Many summer residents of Atlantic City, N. J., carry their portable sets with them to the beach. Miss Beryl Williams is one of these. Having tired of the ocean waves she is resting on the sands and picking up something interesting via radio.

(C. Kadel & Herbert)

Phil Hughes and Willie Keeler have finished a strenuous eighteen holes and are now listening in while resting for a final round. Not only in the club house but on the course radio is gaining in popularity at golf clubs.

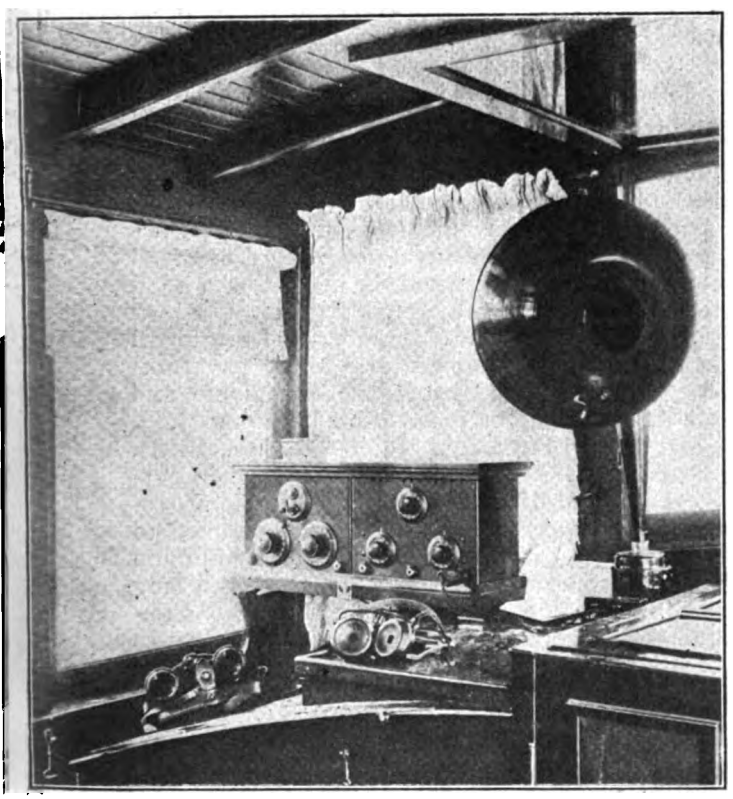
(C. P. & A. Photos)

Capt. Gypsy Pat Smith, famous English revivalist, is recovering from an operation at a nursing home in Edinburgh, Scotland. His hours of convalescence are lightened by listening in to radio programs.

rmeates the Whole Wide World

(C. Kadel & Herbert)

Charles Hall, of New York City, using a bed spring aerial and an interesting combination of a neutrodyne and tuned radio frequency, easily receives WOC, WOAW and WDAP right in mid-summer. Mr. Hall has a unique cut-off arrangement in this set by which he can use a crystal detector or one or more tubes.



(C. Kadel & Herbert)

Here's the neat receiving set on the beautiful yacht of Harry C. Stevenson, of Rochester, N. Y. The set is grounded to the shaft of the engine. For an aerial he uses a rubber insulated cable about 75 feet long with the outer end carefully sealed and insulated. This is tossed in the water and drags after the yacht. It is said to work well.

(C. Photonews, N. Y.)

New York firemen haven't much spare time, but with a pool table and a radio set presented by a friend, the men of Engine Company No. 8 are well fixed to enjoy their leisure. Captain Joseph Donovan is tuning in.

(C. Underwood & Underwood)

Harry Schwartz is here shown giving pointers on the construction of radio sets to Boy Scouts at Camp Spence, Bear Mountain, N. Y. A day's tramping in the forest, a lesson in woodcraft, a cooling plunge in the lake or stream, dinner and a radio program—well, it's good to be a Boy Scout!

(C. Keystone View Co.)

Mlle. Suzanne Langlen, the greatest woman tennis player of them all, is here shown broadcasting tennis instruction to thousands of fans. This is an unusually quiet pose for the tennis star.

Google

Scott Clariphone Kills Static

By Carl H. Butman

THE Scott clariphone, an acoustical device for the elimination of static, will undoubtedly be one of the greatest advancements in radio communication when perfected, naval radio experts declare. Through its selective action the clariphone subdues the mechanical sounds of discontinuous character and sustains the continuous notes as well as uniformly pitched sounds, enabling stations transmitting from a long distance through static interference, to be read much more easily.

Although the inventor, Chief Electrician Wm. J. Scott, U. S. N., began work on this static eliminator eleven years ago and filed an application in the Patent Office in January, 1921, little except the name of the filtering device has been made public. Since successful tests at the Bureau of Standards and at Naval Radio Central at Washington, naval officials have decided to release certain facts regarding the unique apparatus in the interest of those who are also fighting summer static in an effort to perfect radio communication.

While the clariphone is still in its experimental stage, the results obtained from the tests in Radio Central seem to indicate that the entire elimination of static may be hoped for in the near future, one naval expert asserts. Without going into the technical details, and the operation is complicated, the writer can vouch for the fact that the instrument works. While in one of the receiving stations on the third floor of the Navy Building a few days ago, we tuned in NPG, San Francisco, which we heard faintly through bad static. By changing from the set of head phones on the regular receiving set to a pair connected with the clariphone, a remarkable improvement was at once noted; the static was reduced materially and the distant signals from 'Frisco came in clearer and sharper. Dispatches from the naval stations NBA, Balboa, and NPL, San Diego, were also read with ease when the clariphone was connected in, whereas the dots and dashes were difficult to distinguish through the phones directly on the receiving set.

Mr. Scott also hopes to be able to eliminate all interference from nearby stations using wave lengths which are close to the wave length that the instrument is tuned to.

The apparatus consists of a large metallic chamber or tube about four feet long and 18 inches in diameter, with adjustable ends slightly smaller in diameter. From the chamber eight smaller tubes or "telescopes" project radially in pairs. Each "telescope" contains a watch case telephone receiver used for introducing the radio signals received from the radio set into the receiving chamber. The incoming sound is then passed through the chamber acoustically, where it is broken up several hundred times, the inventor explains, by the internal arrangement. All of the static is absorbed by over 10,000 separate pieces used in its construction. Exactly how is not divulged. To a lesser degree, the sound waves themselves are also absorbed in the filtering process. A weaker but a clear note is picked up by four microphones, two on the top of the cylinder and one on each end. The microphones are connected in parallel to the primary of a transformer, the secondary being connected to a head set where the operator receives the outcoming signals after the static is eliminated. The sound of the signals may also be heard through two acoustical phones also attached to the top of the apparatus. When the outcoming sounds are found too weak, they may be amplified in the usual manner.

Whatever the internal acoustical mechanism may be, the Patent Office recognizes it as a pioneer invention, and Mr. Scott has patents pending in the United States and several foreign countries. The clariphone will operate for the elimination of static either in radio telegraphic or telephonic communication.

To date only one instrument is in operation, but another with some improvements is under construction, it is understood. The inventor is now engaged in working out a practical method for producing a good audible tone to the sound waves which leave the four microphones on the cylindrical chamber and are heard in the head phones by the operator. Many naval experts have examined and tested the clariphone and have made helpful suggestions. Chief Gunner J. J. Delaney and Chief Radiomen John Gilmore, E. H. Wilkinson and E. L. Cash are aiding Mr. Scott in perfecting the radio end of his invention. With improvements now under way the apparatus can be tuned to maximum strength wireless signal and minimum strength of atmospheric disturbance, which goes a long way toward improving long distance wireless communication. The apparatus is not yet available to owners of private receiving stations nor amateurs, because of its cost, but future developments and production on a large scale may make it a practical adjunct to general radio reception.

The navy is particularly interested since apparatus of this sort could be used on its ships and shore stations, particularly in the tropics where static interferes greatly with communication. Lighter sets for adoption in airplanes and submarines for the elimination of various forms of noise are also being considered.

Consider the Others

MANY operators of sets like to tune in long distance stations. Many of the sets are single circuit regenerators that oscillate to beat the cars, and re-radiate everything. When tuning in, consider the other fellows in the surrounding district and do not tune by the beat method. It is only through everyone co-operating in this matter that any help can be had on the worst problem of interference that has yet come up. Think it over, fellows, and tune in right.

Radio Dealers, Do You and Your Salesmen Set the Right Example?

You believe, of course, that radio is a great thing, and that every home should be radio equipped.
Have you a radio set in your home?
Have your employees sets in their homes?
Think it over for a moment.
Salesmanship begins at home!

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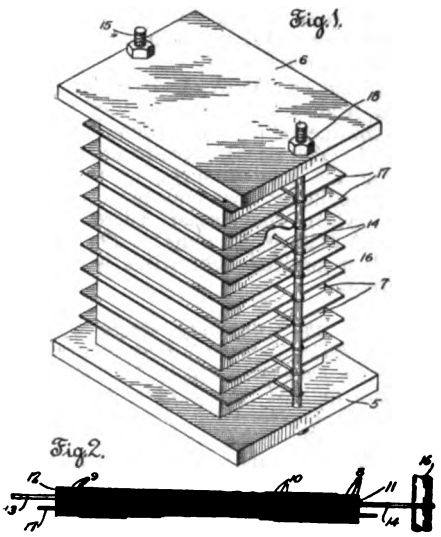
Latest Radio Patents

Dubilier's Electric Condenser

No. 1,455,781: Patented May 22, 1923. Patentee: William Dubilier, New York, N. Y.

The object of this invention is in the provision of an improved condenser or electrostatic accumulator in which induction takes place through its mass, causing a difference of potential energy at its terminals.

Such condensers are usually composed of a plurality of thin sheet metal or metallic foil layers separated by a non-conducting material, such as mica, paraffine paper, etc.,



Dubilier's improved electric condenser.

the opposite layers forming terminals from which current is received and delivered.

In condensers in which mica is used as the dielectric, where the size of the mica sheet is limited for commercial reasons, if large capacities are required, say for example one microfarad, the number of layers and sheets must be increased.

A large number of sheets must be built up into a single unit and if mica sheets of for instance 2x3 inches by .003 be used, a one microfarad unit will be about two inches thick.

With the use of commercial sizes of mica in order to get a microfarad, almost 1,000 sheets will be used in the unit. We then will have about 500 layers piled on one side electrically connected together and 500 layers on the other side of the pile electrically connected together.

If there should be one defective mica sheet in this pile which for some reason or other should break down after the unit is assembled, the entire condenser becomes defective and it becomes expensive to repair.

If however, we should make small groups or sections of say 50 layers and then connect these 20 groups or sections in one pile with insulated separators between each group, and the group containing the defective sheet should break down, the whole unit of course will be defective but it will be much easier to repair by taking out that single group or section which contained the defective sheet.

If however, these groups or sections were connected in parallel through a thin or light conductor which is easily fusible, as for instance a small lead wire, then if one section or a sheet in one section should break down, all the remaining sections that are connected in parallel will momentarily discharge through that broken down section with the result that a heavy rush of current will surge through that single section, it acting somewhat the same as a spark gap across a condenser, with the result that the heavy current will rush through the single light conductor connecting the defective section.

This conductor will fuse thus opening the circuit to the defective group or section, similar to the action of a fuse in an electric light circuit, automatically disconnecting the defective section, with the result that the remaining sections remain in circuit and continue to function.

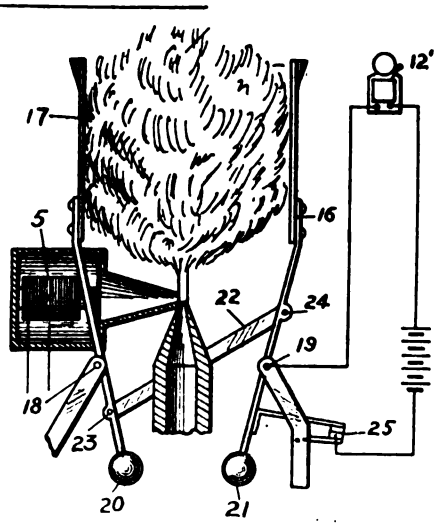
This invention is designed to overcome the defects as above stated, in that, should the insulation fail between any of the plates or sheets constituting one of the several series or groups of condenser elements, those remaining in groups will continue to function effectively.

Electric Indicator for Vibrations of the Air

No. 1,454,965: Patented May 8, 1923. Patentee: Elmer A. Sperry, Brooklyn, N. Y.

This invention relates to a method or means for indicating periodic wave motions of the air which are not readily detected by the ear. Such wave motions may consist of feeble sounds or of wave motions of a frequency above or below that of audibility. The invention has especial relation to the detection of feeble wave motions produced by radiant energy receivers, such as used in wireless telegraphy.

According to my invention I make use of a sensitive fluid jet such as a manometric flame which, as is well known, consists of a long splindling slender gas flame. Such a flame when acted upon by sound waves or the like instantly changes its form by first squatting or greatly shortening its length and then broadening or flaring out laterally in all directions as though effected by a blast or a draught. The moment the vibration ceases the jet resumes its former proportions. Adjacent the flame I place some



Sperry's electric air vibration indicator.

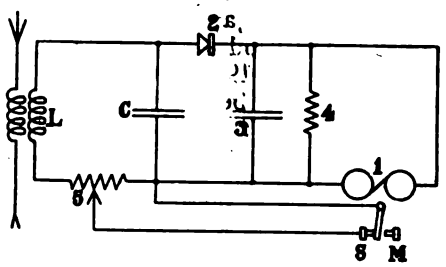
form of sensitive electric apparatus brought into operation by changes in the form of the flame to operate an indicator.

Wireless Telegraph Receiver

No. 1,459,896: Patented May 22, 1923. Patentee: L. B. Turner, London, England.

In high-speed signalling by wireless telegraphy with long waves and with receiving circuits of small damping, limitation of speed is imposed by the slowness with which the oscillation produced in the receiving circuit during a dot or dash of the signalling code dies away during the subsequent space of the signalling code. The rate of dying away is increased if the damping is increased; but the amplitude reached is then decreased, which implies a decrease in the sensitiveness of the receiver.

The present invention consists in the provision of means whereby the received signal (dot or dash, in the Morse code), upon reaching an amplitude competent to operate the receiving instrument, introduces additional damping into the receiving circuit;



Turner's wireless telegraph receiver circuit.

which additional damping is maintained as long as the incoming signal is maintained but automatically disappears, or substantially disappears during the next spacing period. The automatic increasing of the damping is hereinafter referred to as "curbing"; and curbing is said to begin when the additional damping is first introduced, and to end when it is removed. The curbing is preferably maintained throughout as large a proportion of the spacing period as possible. Under these conditions, the decrement of the uncurbed receiving circuit may be made small, thus favoring the growth of the oscillation in the receiving circuit up to its operative amplitude; the curbing thereupon effected imposes a restriction on the further growth of amplitude; and, if the curbing is maintained for a time after the cessation of the incoming signal, the rate at which the amplitude dies away towards zero is greater than that corresponding to the decrement of the uncurbed circuit.

Curbing may be effected in all or any of the receiving circuits, including the antenna circuit itself; but the arrangement preferred is one in which the antenna is relatively highly damped, and has coupled to it a circuit of specially low decrement to which the curbing is applied. The low decrement of the uncurbed receiving circuit may be arrived at in any known way, with or without the aid of retroactive thermionic triode circuits associated with the receiving circuit for the purpose of reducing its decrement in the well known manner.

Another Subscriber Likes the Diet We Provide

EDITOR, RADIO WORLD: Enclosed please find check for six dollars. Kindly send RADIO WORLD for another year, beginning July 14, 1923, taking care not to miss sending me any of the fifty-two issues. I have a copy of all issues to date, and make the fur fly if the mail doesn't bring each copy on time. RADIO WORLD is breakfast, dinner and supper to me.

Yours very truly,

L. HAMILTON ADAMS, JR.

10 Roosevelt St.,
Norwalk, Conn.

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Answers to Readers of Radio World

Kindly advise me if the enclosed radio-frequency circuit can be used with the De Forest coils and triple mounting?—Arthur Peterson, Rockaway Building, South Ozone Park, L. I.

You could not use the De Forest coils and mounting with this circuit without changing it entirely around. It is regenerative as it stands, and no benefit would be derived in changing it.

* * *

I recently constructed a reflex set using one tube and a crystal detector, with a honeycomb coil and condenser as a radio-frequency transformer. I can take the crystal detector out of the circuit and still hear signals. What is the trouble?—Charles Leslie, Box 134, San Francisco, Cal.

It is quite evident that, in the construction of your receiver, you made some mistake, otherwise you would not be able to hear signals when you remove your crystal detector. Go over your connections very carefully, and make sure that your leads do not run parallel. See that everything is connected right, or, better yet, rehook your set. Be extremely careful about your battery connections. You are using your tube as a rectifier (detector) and the current is leaking through some of your leads. Reflex sets require very careful construction in order to work correctly, and you should not go about the construction of these sets unless you are prepared to take every care and precaution and plenty of time in the wiring and use only the best of parts.

* * *

I am located just on the outskirts of Rochester, N. Y. I have great trouble getting distant stations to the South and Southwest, although I use five tubes and can get the far Western and Northern stations. I should be able to get greater distances as the set operated perfectly when up in Albany, and stations all over pounded in; but where I am located I cannot get anything but at one location.—Gene Fowlman, 132 Main Street, Rochester, N. Y.

It is quite evident that you are in a "dead spot," as can be seen by your explanation. Nothing can be done to alleviate your trouble as there is some condition existing which is causing it that you have no control over. It may be that your set is located in a district that has some steel structures that are robbing you of your signals, or it might be some other cause. Suggest that you ask some of your radio friends in Rochester and see if they are bothered in the same manner. Writing your troubles to the Radio Division, General Electric Co., Schenectady, N. Y., would probably give them some information that they would be glad to investigate.

* * *

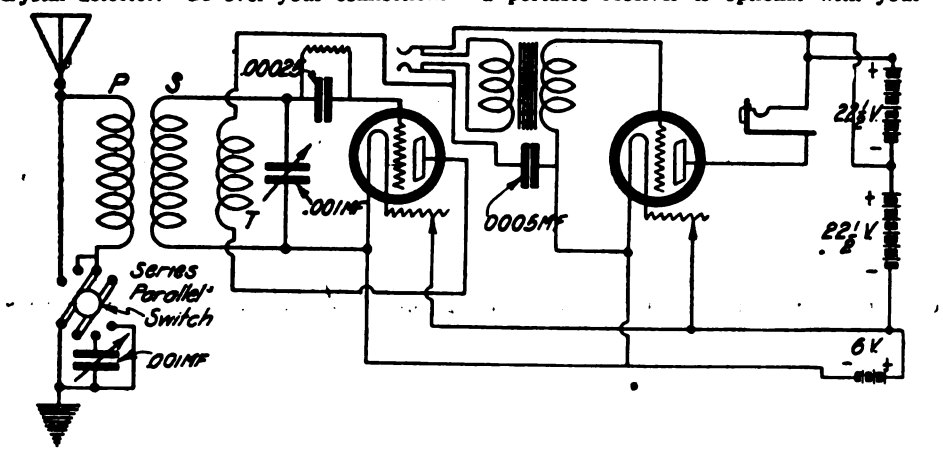
Do the call letters signify anything particular outside of a certain station? Can each station pick its own call letters?—A Radiofan, Cincinnati, Ohio.

The call letters are given as an indication of each station and do not have any valid meaning. The call letters are assigned by the government, and are arranged alphabetically and given in order.

* * *

Will you publish a circuit diagram of a receiver capable of receiving from 150 to 25,000 meters using two tubes? It is to be a portable receiver.—A. B. June 11 Fairview Avenue, New Brighton, Staten Island.

The circuit you wish is published herewith. The fact that you want to make it a portable receiver is optional with yourself. We can only furnish the circuit diagram. The design of the set is up to you.



Three circuit honeycomb coil set with one stage of amplification, requested by A. B. June. A series parallel switch is used to give a wide range of adjustment with but few primary coils.

* * *

The light for the house and barn is furnished by a 32-volt, gasoline-driven generator. Can I use this to light the filaments and supply the plate voltage of the tubes of my set?—Charles Customer, Spring Lake, N. J.

You can do this by the use of proper resistances and a filter system to remove the commutator ripple. Be very careful when using this voltage, however, or you will blow out your tubes. In the long run it will be safer if you use the regulation battery for filament supply.

* * *

I purchased a three-tube set made by the ..... company last winter. I have heard that, during the summer months, distant reception is impossible. During the winter my range was 2,000 miles, yet now I can only get extremely local stations within a range of 50 miles and with extremely poor volume. Should my reception and volume be cut down that low?—J. S. Domidion, 155 West 45th Street, New York City.

Your reception will not be as great in the summer as in the winter, but the enormous cut in reception that you notice probably is not due to this condition. Examine your antenna, especially your insulators, and see if they are not shorted by dust and dirt. Clean them thoroughly and look at your lead-in connection. Examine your ground connection thoroughly and try using another ground in connection with it. Examine your phones carefully and test them, if possible, against another pair to see if it is the phones or the set itself that is at fault. Renew your B batteries.

* * *

I recently constructed the Grimes' inverse duplex receiver as per instructions in Radio World *for June 2. Will it be possible for me to operate three loud-speakers on different floors of my house with the aid of a single power amplifier in connection with this set? Should I lay the wires in conduit? What size wire should be used in wiring for this purpose?—John Guilbert, 232 West 4th Street, Newark, N. J.*

You should be able to operate three loud-speakers from a single power amplifier on the set you mention. They should be wired in parallel. You do not have to use conduit in wiring the loud-speakers, as the tenement and building laws only prescribe that method when commercial currents are being used (110 or 220 volts). The double stranded or braided light wires will serve this purpose.

* * *

What is the consistent range of the De Forest reflex loop set? I have been told that signals have been received 2,800 miles, but wish to find out before going any further.—E. L. MacNabb, 3 Water Street, Quebec, Canada.

We cannot specify the range of any receiver as there are too many variable factors which affect the range of such apparatus. However, it is perfectly possible to cover the range you mention with such a receiver, conditions being favorable.

* * *

Concerning the WD-11 circuit described by Ortherus Gordon in Radio World *for Jan. 20. I cannot get it to work properly. There seems to be no difference whether I have the tickler coil one-half or three inches away, it does not vary the tuning. Also, my antenna condenser does not vary the wave length.—Eugene L. Kills, 524 W. Fourth St., Cameron, Mo.*

Reverse your tickler connections and make sure that you have it wired correctly. This is the conventional single circuit tuner, using a tickler in the plate circuit to produce regeneration. As to your condenser, there is no reason in the world why it should not vary the wave length if it is properly inserted. Make sure that it is not short-circuited. If it is this would cause the trouble that you are experiencing.

* * *

Is it possible to lessen interference by the use of resistances in series with the antenna inductance? I am bothered by considerable inductive hum from the feeder lines of the railroad that run parallel to my antenna.—Morris Muller, East Philadelphia, Pa.

Putting resistances in your antenna circuit would not tend to lessen the induction hum you notice. Place your antenna at right angles to the feeder lines and use a filter coil such as is described in Radio World *for January 20, page 20.*

* * *

Is it possible for me to accommodate the neutrodyne principle that is so popular with the set shown herewith?—Louis Plantaka, 244 East 72d Street, New York City.

It is impossible to apply the neutrodyne principle to the receiver you show. It is a three-circuit regenerative, and if you kill its regenerative action you are losing the advantage of the circuit.

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Radio in Summer

THE man who purchases a Magnavox for its clearness of reproduction, finds additional advantages in its use which contribute greatly to his enjoyment of Radio.

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Magnavox Reproducers and Power Amplifiers can be used with any receiving set of good quality. Without Magnavox, no receiving set is complete.

Magnavox R2 Reproducer and 2 stage Power Amplifier (as illustrated) **$115.00**

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field **$60.00**

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . **$35.00**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

A clearer Radio voice, sounding above the tumult of vacation time

WHEN days are spent in summer's outdoor playgrounds, Magnavox needs only an instant's notice to supply dance music, sporting news or entertainment for all.

Open places test impartially the real quality of Radio reproduction—with Magnavox equipment your receiving set will give superbly adequate performances, indoors or out, the year 'round.

Magnavox products can be had of good dealers everywhere. Send for copy of unusual booklet.

The Magnavox Co., Oakland, California
New York: 370 Seventh Avenue

MAGNAVOX Radio

The Reproducer Supreme

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Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Morker Electric Co., 340 St. Mary St., Phoenixville, Pa. (Retailer.)
C. D. McDaniel, 2072 East 55th St., Cleveland, Ohio.
G. S. McIntire, 412 N. Fifth St., Apollo, Pa. (Dealer.)
Fred Hoffman, Jr., 1963 Sixty-first St., Brooklyn, N. Y. (Interested especially in transmitters.)
Henry Boehning, 2205 Eighth St., Brooklyn, N. Y. (Wants 30-volt, 5 to 10-ampere D. C. generator or motor generator for radio work.)
Donald McCamman, Lebanon, Ky.
W. B. Dobson, 201 University Ave., Toronto, Ontario, Canada.
Ratcliff & Broyles, Barnes City, Iowa. (Retailers.)
George Fisher, P. O. Box 514, Atlantic City, N. J.
J. W. Irwin, 5754 Holmes Ave., Los Angeles, Calif. (Builds sets.)
New England Stock Co., Box 79, Haverhill, Mass. (Distributors and retailers.)
H. H. Oge, Box 32, Boonville, Ind. (Wants to represent reliable wholesalers.)
N. Appelbaum, 178 Middleton St., Brooklyn, N. Y.
C. H. Barnett, Hagerman, New Mexico. (Builds sets for the public.)
Ralph L. Arthur, 924 South Sixth St., Atchison, Kansas. (Dealer.)
E. E. Gosher, Brandon, Vermont.
Howard E. Litchfield, 14 Shepard St., Lynn, Mass. (Constructs sets.)
Warren T. Slowen, West Haven, Conn.
Wesley McArdell, Radio Construction Club, Brooklyn Technical High School, Manhattan Bridge Plaza, Brooklyn, N. Y.
Samuel O'Toole, 75 Baldwin St., Pawtucket, R. I.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEER, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

He Boosts the Radio Game

MR. O. H. HOVEY, general manager of the Southern Radio Supply Company, Perry, Okla., is a real booster for the radio industry. He seems to take a broad view of the business and does many things easy for any one to do to advance the business in a broad-gauge manner. For instance, his company's stationery is printed in two colors on tinted stock and carries the following good propaganda in red: "Get the market reports. Enjoy splendid concerts and lectures. Get the weather reports. Outfits cost no more than a good phonograph. Give far more pleasure and satisfaction, and no more trouble to operate."

A New Loop Aerial

A LOOP aerial that should prove of interest to amateurs because of its inexpensiveness and convenience is being manufactured by the Ritter Radio Corporation, 232 Canal Street, New York City. The loop is joined with dowels with an upright fitting into a slot at the base. The crosspieces are slotted to take the enameled wire which is sold with the outfit. The loop can be stained to match the color of the particular set for which it is purchased.

Westinghouse Sales Grow

THE Westinghouse Electric & Manufacturing Co., in the three months ended June 30, 1923, booked new contracts valued at $47,649,129, an increase of $15,530,205 over the same period last year. Billings for the same period were valued at $35,094,884 against $25,713,707 last year. In the first quarter of the year bookings were valued at $45,741,000 and billings $39,577,000.

Horne Company Changes

The Horne Electric & Manufacturing Company, whose main office is at Mercer and Colgate streets, Jersey City, N. J., have succeeded the Horne Manufacturing Company and will continue the manufacture and sale of the well-known Horne radio products.

New Radio and Electric Firms

Wayman Electric & Manufacturing Co, Wilmington, Del., $200,000. (Colonial Charters Co.)

Albert Weber, New York City, electrical devices, $50,000; A. Weber, L. Inkeles, M. Kane. (Attorney, L. J. Feinstein, 47 West 34th St.)

United-Edison Electrical Contractors, Brooklyn, N. Y., $5,000; J. Katsch, A. Goldberg, H. Schein. Attorney, R. H. Kittel, 522 5th Av., New York City.

Steel-O-Graph, New York City, make electrical appliances, $250,000; W. C. Lamphier, J. Wood Jr. (Attorney J. S. Twaddel, 261 Broadway.)

New York Central Electric Corp., New York City, has increased its capital from $7,000,000 to $10,000,000.

Rubes Radio Manufacturing Company, Delaware, $125,000; Rep. C. A. Vauhan, 302 Church street, New York City.

Drew Electric Construction Co., Rochester, N. Y., $10,000; G. E. Drew, G. H. Pond, F. B. Warren. (Attorneys Carnahan, Pierce & Block, Rochester.)

Penn Fibro-Electro Co., deal in transmitting and receiving apparatus radios, $500,000; Arthur Johns, Clifford Roberts, John E. Voege, New York, N. Y. (U. S. Corporation Co.)

Home Electric Co., N. J., 300 shares preferred stock, $100 each; $1,000 common, no par value; A. C. Maccabe, 50 Church St., New York City.

Warner Speed Control Corp. of America, New York City, to manufacture motors and engines, 20,000; G. and A. Worsnop, W. G. Lovatt. (Attorney, H. S. Hechheimer, 1540 Broadway.)

International Patents Development Co., Wilmington, Del., engineers and contractors, $1,000,000; Frank H. Hall, Daniel Royse, New York, N. Y.; Arthur R. Oakley, Pearl River, N. Y. (Registrar & Transfer Co.)

Electric Milker Corporation has changed its name to Electric Products Corporation, Chicago, Ill.

Superior Radio Inc., has changed its name to Shipley & Co., Inc., Philadelphia, Pa.

Put Your Shoulder to the Wheel for the Second Annual National Radio Week!

LAST fall the idea of National Radio Week was originated in the editorial columns of RADIO WORLD. The radio press and trade generally took up the matter and everybody worked hard to make this first annual seven-day event of importance.

Another year is swinging around, and it is time now to think of the Second National Annual Radio Week. Every radio editor of a daily paper, publishers of all radio magazines, and manufacturers, distributors and dealers should give careful thought to the Second National Radio Week.

We shall be glad to have special opinions from all those interested. What do you think the date should be, and what are the special features you would suggest for this seven-day period? Last year's National Radio Week came just about the time when folks were making purchases for holiday gifts. Why not fix on about the same period this year?

RADIO WORLD does not claim ownership of the National Radio Week idea. It merely acted as the original sponsor. The event is too big a thing for any one publication to try and keep to itself.

Now, let's all get together, make the right kind of preparations, and see if we can't make the Second Annual National Radio Week bigger, better, and more far-reaching in every way than the initial event of last year. THE EDITOR

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Newark, N. J., Considering City Broadcasting

EDITOR, RADIO WORLD: Your favor of the 23d instant came duly to hand requesting an opinion from Mayor F. C. Breidenbach regarding a municipally-owned-and-operated radio-broadcasting station, and was taken up at a meeting of the Board of Commissioners of the City of Newark, held this day.

Hon. William J. Brennan, Director of the Department of Public Safety, moved that your letter be referred to Mayor F. C. Breidenbach. The motion was adopted.

Very truly yours,
W. J. EGAN,
Newark, N. J. City Clerk.

Springfield, Mass., Is Lucky on Broadcasting

EDITOR, RADIO WORLD: Replying to your request of the 23d inst., would say that the Westinghouse company has a large equipment in this city, from which they are glad to broadcast anything the city desires to send.

I should think cities not so favored would need a municipally-owned station—a source of pleasure and profit.

Yours very truly,
EDWIN F. LEONARD,
Springfield, Mass. Mayor.

Baltimore Considering a Broadcasting Station

EDITOR, RADIO WORLD: I acknowledge receipt of your letter of July 23 regarding municipally-owned radio-broadcasting station for Baltimore.

I have had this matter under consideration for some time, but at the moment no definite action has been decided upon.

Yours very truly,
HOWARD W. JACKSON,
Baltimore, Md. Mayor.

Enjoys Us, But Wants a Radio Daily

EDITOR RADIO WORLD: I am a regular subscriber to RADIO WORLD and wish to say that I have enjoyed reading it more than any other radio magazine published. It shows the newest things first and is also full of valuable information. My only regret is that it is a weekly magazine instead of a daily.

Yours truly,
KENT DECKARD.
Rusk, Texas.

Radio Weddings Now in View

APPLICATIONS are coming by every mail from those who wish to participate in the radio wedding which is to be broadcast by WLW of the Crosley Manufacturing Company at the Fall Festival to be held during the last week in August and the first week in September from the Cincinnati Fall Festival. There will be two weddings, one each week, and the whole radio world is invited to be "air guests." A receiving set is all you need to be "present."

Station KFHX Is Correct

IN RADIO WORLD for July 14 the call for KFHX, operated by the Nelson Manufacturing and Supply Company, Hutchinson, Kansas, was published in a list of new broadcasting stations of KFHS. This was incorrect, according to Mr. R. A. Nelson. The correct call is KFHX.

Broadcasting of Fights Helps Demand for Radio Goods

THERE is no longer any doubt that the broadcasting of big fights means a great deal to the radio trade. This was noticeable immediately following the broadcasting of the Firpo-Willard contest. On the day after this event the dealers in New York and throughout the country, particularly in the East, noticed an increase in demand for sets and parts, and the same thing obtained before and after the broadcasting of the Leonard-Tendler bout last week.

The broadcasting of the latter fight, by the way, was handled in masterly fashion. Major J. Andrew White was the man at the microphone. Not only did his voice carry clearly, but Major White made his description so graphic that he delighted millions of fans throughout the country, many of whom have declared that this was the most satisfactory fight broadcasting in the history of radio.

Gimbel's Radio Sale a Wonderful Success

GIMBEL BROTHERS, New York department store, whose purchase of approximately $3,000,000 worth of radio receiving sets from the Radio Corporation of America was announced in last week's issue of RADIO WORLD, have scored what is probably the biggest selling success in the history of the radio industry. The sets were priced at a comparatively very low figure and heavily advertised in the New York daily newspapers. Gimbel Brothers inform RADIO WORLD that over 1,600 sets were disposed of during the first two days of the sale. At the time of going to press sales figures had not been received from the firm's stores in Philadelphia and Milwaukee, which also participated in the event.

Wants Radio Sets for Mail Order Trade

EDITOR, RADIO WORLD: We are contemplating entering the mail order field, and desire to specialize in radio equipment.

Can you furnish us with a list of manufacturers who supply dealers with catalogs for imprint, and also those firms who specialize in small, complete sets at a price which would be low enough to make them specials?

Our activities will be mostly confined to the farmers of foreign birth and we, of course, do not desire to handle trash of any kind, but would want to guarantee all equipment sold by us as far as possible. Very truly yours,

MAHLER'S TRAVEL BUREAU,
By Richard J. Ward.
205 Seventh Ave., New York City.

Likes Our Style—Thanks!

EDITOR RADIO WORLD: As per your subscription offer, I enclose herewith my check for $6.00 in payment for one year's subscription. Your magazine is far-and-away the most interesting and instructive—genuinely helpful—of any now on the market, especially to the thousands and thousands of us who have neither the time nor the desire to become expert radiotricians (or whatever you call 'em), and who nevertheless enjoy our broadcasting-receiving instruments and want to keep in touch with the general progress of radio.

You boil it down for us, give us the essentials, aren't ashamed to use everyday English (some of the publishers foolishly think the way to impress their readers with their superior wisdom and learning is by using extremely technical terms and the terminology of the most expert electrical engineering shopwork), and the questions of your readers do not seem to bore you.

Sincerely,
H. L. SMITHTON.
Cincinnati.

Radio Trade Notes

Modell's has opened another store at Whitehall and Stone streets, New York City, to meet the radio needs of lower Manhattan and residents of Staten Island who use the ferries.

* * *

Freed-Eisemann Radio Corporation, 255 Fourth Avenue, New York City, announce that they have recently added to their organization Mr. A. B. Ayers, formerly with F. D. Andrea, Inc. Mr. Ayers will act in the capacity of Eastern District Sales Manager.

* * *

C. C. Henry, of the Federal Telephone & Telegraph Company, has been appointed a member of the board of directors of the Radio Trade Association of New York City, to fill the unexpired term of C. H. Love, resigned.

* * *

Leading manufacturers to the number of 45 already have signed contracts for space in the second annual American Radio Exposition, to be held in Grand Central Palace, New York City, October 6 to 13.

* * *

Poster & Co., manufacturers of panels, have removed to 244 West 42d Street, New York City.

* * *

The Mercury Radio Products Company, Little Falls, N. J., has been granted the second license issued by E. L. Grimes, of Staten Island, N. Y., for the manufacture of the Grimes inverse reflex, with exclusive rights to the music field, as well as rights with other licensees in the radio field. The Sleeper Radio Corporation, of New York, is at present the only other licensee.

Radio Trade Association to Meet at Radio Show

THE board of directors of the Radio Trade Association, New York City, has accepted the offer of the American Radio Exposition Company to conduct a series of meetings at the Grand Central Palace during the fall exposition of the American Radio Exposition Company which will be held the week of October 6th. The program committee is working on a list of speakers. These general meetings doubtless will be of interest to the entire trade. Exact dates and hours of meetings as well as lists of speakers will be announced later.

WLW Now Used by Salesmen

J. L. WOODS, JR., sales representative of Crosley Manufacturing Company, Cincinnati, has left for the west coast states, but before going he was the center of a re-christening party when he was given a new first initial W in order that he could use WLW as his initials. These stand for the WLW designated by the government as the call letters of the Crosley radio broadcasting station. He now signs his name W. L. Woods, Jr.

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Patent Lawyer
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2276-P Woolworth Bldg., New York City

Return of the Lightning Rod

HE lightning-rod is coming back, says an editorial writer in the New York World. The first electrical scientists of the time, Thomas A. Edison and Dr. Charles P. Steinmetz of the General Electric Company, have reindorsed it, when properly installed, as a protector of buildings from fires caused by lightning. The National Board of Fire Underwriters now gives a great practical push toward its restoration by declaring that 99 per cent. of such fires can be prevented by a general use of the rod, and by offering its services for the adoption of right methods of installation.

It is a new vindication for Benjamin Franklin and the first lightning-rod, which grew out of his kite experiment some 170 years ago. But it needs to be said that in all this time electrical science has never flatly condemned lightning conductors on buildings and other lofty objects as useless. What killed them in popular favor and use was the "lightning-rod man" and his tricky commercialization of the Franklin discovery. Memories of men now living easily go back to the time when this person was considered a worse pest along the countryside than the book agent or the Yankee-notion peddler. Faulty material, bad insulation, superficial grounding, and failure to follow a direct path from the tip of the rod to the ground, commonly made it useless and often worse.

Against a return in the lightning-rod's comeback of this ignorance and petty swindling, owners of exposed property can have the help of the fire-insurance companies, and with it the incentive of reduced insurance rates. Nor will the run of humankind fail to gather comfort from this assurance of electrical science in its present rapid and extraordinary developments that the dreaded lightning stroke may yet be robbed of its power to injure or destroy where due precaution is taken.

No Good

SAY, Sam, what did yo' all do wif dat radio set you bo't for yo' Melindy?"

"Done gone trow de darn ting fru de winder. Sum smart perfesser told us over it dat chickun oughtn't to be eaten, and prescribed cown beef 'stead. I ain't gonna have no man tellin' me how to reg'late my meinyou."

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City and State.....

If you wish two maps, one for yourself and one for a friend, send $5.00 for a yearly subscription and the two maps will be sent to different addresses if you wish.

Telephoning Over High Voltage Lines

By Lloyd Jacquet

EXECUTIVES from large power plants from various sections of the United States, as well as officials of the Consumers' Power Company of Michigan, witnessed the first demonstration of telephoning over power transmission lines over the company's system between Jackson and Battle Creek last week.

The celebration upon the occasion of the opening of the first new high frequency automatic telephone system was in charge of B. E. Morrow and C. W. Tippy, officials of the Consumers' Power Company, and the first to talk over it.

This system has just been installed by engineers of the Westinghouse Electric & Mfg. Company, who developed and designed the installation. Only two sets, located at Jackson and Battle Creek, are completed. Four other similar stations will be installed at various points along the six hundred miles of transmission lines.

The installation on the Consumers' Power Company of Michigan is a long step in advance of anything yet attempted in experiments with "wired wireless."

This system provides for two-way communication, similar to an ordinary telephone line system. While the radio impulses are guided by the high voltage transmission lines along the entire system, in event of breaks in the power lines, communication is not interrupted, as the radio impulses readily jump the gap. In fact, signals can be exchanged even if several miles of transmission lines are down. During lightning storms, which will interrupt ordinary line telephones momentarily, speech can be transmitted without difficulty over the system. This feature of the installation gives it a marked advantage over the conventional wire telephone circuits.

The high frequency apparatus, or the radio units of the system, are located at the various terminal stations. Two antenna wires are strung for a short distance on the towers which support high tension power lines. One of these is a sending antenna and one used exclusively for receiving. The antenna wire is given about 12 feet clearance from the power line wire. The upper or transmitting antenna is connected to the transmitting set and the lower antenna to the receiving set.

High frequency currents are generated by a 250-watt vacuum tube similar to those used in broadcasting stations. This tube operates on 2,000-volt direct current. The high frequency current flows into the transmitting antenna and instead of being broadcast through the air, it induces, by electrostatic and electro-magnetic induction, corresponding high frequency current in the adjacent power line and this high frequency energy, superimposed upon the energy transmitted normally by the power line, is carried on the power line to the receiving station where, by induction, it is led into the receiving set through the receiving antenna. This unit is an ordinary long wave, coupled circuit radio receiver. It is equipped with a detector and one-step amplifier.

The high frequency currents generated by the 250-watt vacuum tube type oscillator and modulated by a second 250-watt vacuum tube to the grid of which the voice frequencies developed by the microphone are applied. A 50-watt vacuum tube is interposed between the relatively weak microphone circuit and the grid of the 250-watt modulator tube for the purpose of amplifying the voice

Station WLW Locates Missing Man

THE value of the radio broadcasting station in its relation to locating missing persons and articles was fully demonstrated when WLW of the Crosley Manufacturing Company, Cincinnati, located Herbert Weber within a day after his description had been sent into the air. This marks the first recovery of a person by radio although thousands of messages and descriptions have been sent to all parts of the world by radio.

Immediately after the church services by radio, WLW broadcast a description of Herbert Weber, a deaf and dumb man whose wife had not been able to locate him. He had wandered off and so the wife turned to the new agency, radio, to help her in her search. She gave a full description of him and then trusted to the modern miracle to do the rest.

T. Paul Jordan of Newtonsville, Ohio, a radio listener to the church services, heard this message of distress and began a search for the missing man. It was not until the next afternoon that the deaf and dumb man was found wandering along a country road. Mr. Jordan approached him and wrote on a paper the message he had heard on his radio receiving set. The man wrote back that he was the missing one. Within a short time he was safely home.

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Radio as a Means of Expression and Contact

By Dr. Lee De Forest

TO celebrate its first anniversary WOR has tonight assembled representatives from the three great principles of expression—the newspaper, the motion picture and the radio—and has done me the honor to speak on behalf of radio as a medium of expression. I like better to consider radio broadcasting as a medium of *contact,* for without question it has already demonstrated the fact that radio broadcasting brings the millions of our citizens, high and low, in cities and in the most remote districts, into contact with our leaders in every field of activity—political leaders, leaders of the drama, of art, great editors, captains of industry, singers and musicians—in a manner in which no other medium since the beginning of civilization has begun to approach. And I hold that it is in this peculiar property of personal contact between the widespread millions of our citizens and the comparatively few gathered nightly in the small auditoriums of our broadcasting stations which is more responsible than any other factor for the immense and ever-increasing popularity of radio.

In 1909, when the idea of radio broadcasting first occurred to me, and the music of the Metropolitan opera singers was for the first time launched upon the ether, and again in 1916, when, for the first time, regular radio concerts were maintained, from the old station at Highbridge, when I had a small but intensely interested audience growing in numbers nightly, there began to dawn before me a vision of the astonishing potentialities of the radio broadcast, which vision the last eighteen months has been bringing more and more into reality. But I confess that in those early pioneer days my eager imagination fell far short of picturing the astonishing hold with which this idea so suddenly gripped our entire nation. And not alone the American people, for I have found that, in England, France, Holland, and even in Germany, wherever the fame of American broadcasting has penetrated it has enkindled to an astonishing degree the imagination of classes which one might doubt would respond so quickly. In truth, the broadcasting idea, which America may be justly proud of originating, is already outgrowing national boundaries. Already the radio telephone is beginning its benign work of breaking down the artificial barriers erected by politics or race. Nothing since the early days of the discoverers has so appealed to the imagination of a nation. No other medium in man's history has demonstrated its unique powers for uniting far separated sections of a great country, for causing to become acquainted dwellers in distant districts from north to south, from east to west. More than the newspaper, more than the postal service, this mighty hearing of the spoken voice in greeting, the public address, the sermon, the lecture, the musical program, is actively uniting us in a bond of common fellowship, common acquaintanceship as no other conceivable instrumentality can accomplish. I predict that, as an educational medium, the radio telephone broadcast will in time prove second in importance only to the public school. Already we see a closer interlinkage between the people of Canada and ourselves, due to the broadcasting idea; and soon these benefits will extend to Europe, between the peoples of the Old World, always heretofore strangers; enemies because strangers and personally unacquainted. When, night after night, the citizens of foreign lands will hear the friendly words, the music and the songs from across strange frontiers, then gradually will the feelings of enmity and suspicion, based chiefly on distance and ignorance of each other, change to understanding and good will. Thus I maintain that radio broadcast with its irresistible educational influence is destined to prove one of the most potent powers for the abolition of war.

So rapidly is this movement growing that it will not be long before the necessary high-power broadcasting stations will be planted in all our cities, each covering a sufficiently wide area to enfold the entire land in a mantle of music; to breathe into every ear which cares to listen voices of comfort, of nightly companionship with the world's doings and the world's best minds. "Just a Song at Twilight," but its lovely echoes are being heard in the miner's cabin, in the rancher's hut, in the living room of the old farmhouse, over the mountain range, beyond the desert, across the silent prairie, over the wastes of sea. And who can say what minds are not awakened, what souls that were deadened, what hearts long embittered by loneliness, will not be stirred to a new life, a new outlook by that sound?

When one seriously considers the human side of this broadcasting idea and its possibilities one must admit that it possesses potentialities for universal education and for all the trail of good which results from universal education, which can be compared only to that brought about during the past five centuries by the art of printing. Only this new revolution will grow to maturity in a decade instead of 500 years—a graphic commentary on the acceleration of man's present progress.

I have for a long time maintained that this educational value of radio broadcasting will prove by far its greatest worth to the people of our country, and, later, of all nations. No doubt just now the entertainment feature is the most striking; the phase most appealing to the popular desire, naturally enough. Unquestionably the fine programs which are now being given by the large broadcasting stations are accountable for the astonishing spread of receiving stations during the past eighteen months.

But comparison of radio broadcasting with the introduction of the printing press is not too bold. When newspaper and press syndicates realize its full possibilities in their own field (and their leaders are rapidly coming to this realization) this comparison will become concededly commonplace. Editors now have a medium where antenna wires take the place of Mergenthaler typesetters, ether waves of ink and press paper, head phones of spectacles, and ears of eyes. It is indeed gratifying to me to note the whole-hearted and enthusiastic co-operation of the American press generally with the broadcasting idea. Without this broad vision on the part of newspaper men the present popularity and astonishingly rapid growth of broadcasting would have been quite impossible.

It is therefore a great pleasure for me to speak to you tonight, in company with that Nestor of the American press—Melville E. Stone, of the Associated Press—who, earlier than any other American newspaper man (as far back as 1899), foresaw something of the immense possibilities of wireless in newspaper service, and who has ever since those early years stood out conspicuously as a believer and advocate in the future of wireless as a medium of contact with the people.

Such occasions as this tonight, when I again take part in the radio telephone broadcasting, which I have labored so many years to bring about, are occasions of profound personal satisfaction. They bring back vividly to me the countless nights of step-by-step upbuilding of this idea, and the device which has made it finally a reality. And with them comes a profound sense of gratitude, for I realize on such occasions as this the personal sense of contact and friendship with the untold thousands of listeners who are realizing with me the actuality of an old dream.

Address by Dr. Lee De Forest, broadcast from Station WOR, July 23, 1923, on its first

An Unusual Broadcasting Anomaly

ALTHOUGH the words of President Harding when he spoke in the Civic Auditorium at San Francisco on July 31 were heard as far away as New York and Washington within one-fifteenth of a second after they were spoken, according to telephone engineers, it was nevertheless the following day and month when they were heard in New York. The President began speaking at San Francisco at 8 o'clock, July 31, which was midnight in New York (daylight saving time), and consequently he was not heard there until August 1.

Delights of Radio for the Hard of Hearing

JOHN G. GEBHARD, of Mt. Vernon, N. Y., writes to the New York Times as follows:

There is one feature of radio broadcasting which should get wide publicity. I refer to radio for the deaf. Not all deaf people can use a telephone, but a large majority of them can, and every one of these would find a good radio an unspeakable joy. To those who have good ears, listening-in is more or less of a mere pastime; but for those whose poor ears catch only a fraction of the words and other sounds around them, radio broadcasting becomes a new and delightful entrance into the joys of hearing.

I am 65 years old and hard of hearing, but the happiest hours of my days are those I spend with my home-built radio receiver. One day stands out with unforgetable distinctness. It was one of those hot June days when the mercury was soaring into the nineties. In the middle of the afternoon, as I was touching up a connection here and there, I suddenly heard the strains of the wedding march, and then and there became an intensely interested listener to a wedding ceremony in Newark, N. J., which was being broadcast by WOR. When I had the best of hearing I never heard a marriage ceremony with such distinctness, every word of the officiating clergyman, every word of the responses of the bride and bridegroom, and the bridegroom's kiss were as plain as if the whole affair were taking place five feet away in my own room.

Early that evening my son asked, "Father, who is WGY?" "Schenectady," I shouted, and clapped on my head-piece to hear two magnificent Gregorian chants from a cathedral, broadcast by Schenectady. At 10 o'clock that same night I enjoyed, with my whole family, every word of President Harding's speech at St. Louis on "The World Court," broadcast by WEAF.

The wonder of it all was that each of these three treats was a complete surprise, extras, which did not appear in the printed programs for the day. No retiring of my radio for the summer! I'm in for listening every day in the year, barring thunder weather.

Radio for the deaf is my slogan, which I wish might be sent out broadcast from

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European Radio Dispatches for American Dailies

THE Canadian Department of Marine has issued a license for the erection of a high-powered press radio station at St. Margaret's Bay, Nova Scotia, near Halifax, to C. F. Crandall of the British United Press, acting for the American publishers' committee. For over a year a group of American papers, including New York, Philadelphia, Chicago and other dailies, has been operating an experimental radio station at Dartmouth, across the bay from Halifax, for the reception of wireless press reports from London and Europe, and relaying them by land lines to the newspapers. The project will now be made permanent.

Radio Broadcasting Now Permitted in Germany

A BERLIN dispatch to the Associated Press states that the popularity which wireless broadcasting has attained in the United States has been directly responsible for a decision reached by the Ministry of Posts and Telegraphs to lift the embargo on wireless telephones, beginning Sept. 1. The present prohibition restricts the use of all wireless apparatus to commercial purposes.

Applications for private wireless telephones must be filed with local post offices, which will supply programs and supervise broadcasting in order not to interfere with the official or commercial use of wireless.

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The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

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VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

MAGNAVOX TYPE R3.—Latest curvex, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kans.

RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

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SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

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CALLS HEARD POSTAL CARDS for DX reports. Station call letters in color. Printed on government or plain postals. $ .80 hundred up. "Used Everywhere—Go Everywhere." Write for samples. Radio Print Shop, Box 582, Kokomo, Indiana.

OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

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VARIABLE CONDENSER—Postpaid, one dollar. Radio Apparatus House, 140 Maiden Lane, New York City.

BROADCASTING POST CARDS—Receiving Station Cards and Sending Station Reply Cards, per dozen, 15c. Peanut Set, everything complete, $30. Cabinet Crystal Sets, $3 to $5. Stamp for catalog. PACIFIC SCREW CO., Dept. R, 645 N. E. 53rd St., Portland, Ore.

STAMP COLLECTORS! Free packet, all foreign, to applicants for 50 per cent. discount approvals. W. K. Rose, Fayetteville, Ark.

CUTTING AND WASHINGTON detector and 2-stage audio amplifier complete with tubes, B Batteries, Storage Battery (100 ampere hour), two sets phones, Dictograph Loud Speaker. Range, 2,200 miles. $75.00. K. C. Matheson, Box 186, Clinton, Nebraska.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

TWO FOR THE PRICE OF ONE—Send $3.00 now for six months' subscription (26 numbers) for Radio World during the coming month and we will send you also Popular Radio or Wireless Age or Radio for six months without any extra charge. Or send $6.00 now and we will send you Radio World for one year (52 numbers) and Popular Radio, or Wireless Age or Radio for one year. These offers not good after July 25, 1921. If you are already a subscriber you can take advantage of this offer by renewing from the end of your present subscription. Sub. Department, RADIO WORLD, 1493 Broadway, New York City.

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ADDRESS SERVICE EDITOR, RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

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(FOR NEW SUBSCRIBERS ONLY)

In order to materially increase our subscription list we are offering for a limited time a special subscription of seven issues of Radio World for $1.00. You may begin your subscription now, or have us start sending the first issue on this subscription offer when you go out of town.

CUT OUT THIS TODAY SO THAT YOU WILL NOT FORGET ABOUT IT

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By M. B. SLEEPER
Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

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Tale of Woe

By G. Lorimer Bascom

I WAS sitting
* * *
AT MY radio set
* * *
HEARING ALL the news
* * *
WHEN A thought struck
* * *
ME LIKE a flash
* * *
THAT I could hear
* * *
EVERYTHING LOUDER
* * *
IF I attached that
* * *
NEW BATTERY that I
* * *
HAD just purchased
* * *
THAT MORNING.
* * *
WITHOUT MORE ado
* * *
I DUG it out
* * *
AND FISHING behind
* * *
MY SET I detached
* * *
TWO WIRES that I
* * *
THOUGHT WERE my B
* * *
BATTERY LEADS.
* * *
THEN I turned on
* * *
THE JUICE and
* * *
THE TUBES tried to
* * *
COMPETE IN brightness
* * *
WITH THE 100 watt lamps
* * *
THAT THEY use on the signs.
* * *
BUT JUST for a second
* * *
BECAUSE AFTER THAT they
* * *
JUST WENT out and
* * *
I REALIZED that
* * *
I HAD spent eighteen
* * *
DOLLARS without ever
* * *
GETTING ANYTHING for
* * *
IT AND I was mad
* * *
UNTIL I realized
* * *
THAT I shouldn't
* * *
HAVE TURNED on
* * *
THE TUBES until I
* * *
HAD MADE sure of
* * *
WHAT I was doing.

Wanted Music

LITTLE WILLIE, aged five, was seen standing on the corner intently watching a man with an ear horn strapped to his head. The man was evidently undecided as to what the main attraction was, until Willie went up and asked him why he didn't turn on the loud speaker and let him hear the music.

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—any one of the following publications
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—POPULAR RADIO or
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—for the price of one:
—Send $6.00 today for Radio World
—for one year (regular price
—for 52 numbers)
—and select any one of the other
—four publications for twelve months—
—This offer good only up to and
—including August 20, 1923.
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This Offer Good Until Only August 20, 1923

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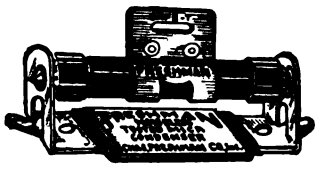

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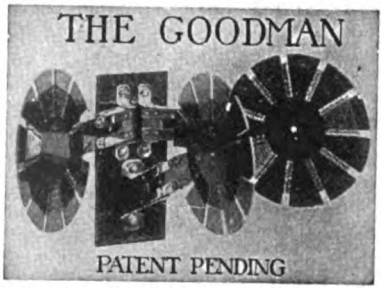
106 SEVENTH AVENUE NEW YORK



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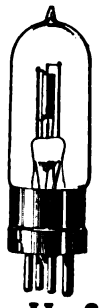
DREXEL HILL, PA.

The Goodman is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.



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Mail orders solicited and promptly attended to.

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514 Clinton Avenue Newark, N. J.

Latest London Water Sport

(C. International Newsreel)

This London girl has found a way to listen in in comfort during the hot weather, and was seen floating in the Thames River on an "inner" tube with her wireless set on her lap.

Stockholders in Electric Companies Rapidly Increase

A SURVEY of 156 electric companies made by the New York State Committee on Public Utility Information shows that in nine years the annual sale of shares of stock in the companies, of a value of $100 a share, increased from 92,310 to 1,750,707 shares, and in same period the number of stockholders had jumped from 4,044 to 198,018. An increase in number of shares sold of approximately 1,800 per cent. was sold to a group of investors whose numerical increases was nearly 4,800 per cent.

The point is made that these figures indicate that the customers of the companies are becoming stockholders in them. There are more than 1,600,000 owners of electrical securities in the United States. In 1914 the average number of shares purchased by each new stockholder was 22.8, involving an investment of $2,280. In 1922, when the number of purchasers had grown from 4,044 to 198,018, the individual number of shares bought was 8.6 or an investment of $880.

Station WJY Takes a Vacation

THE call of station WJY, New York City, with one exception will not be heard during its usual program period until some time in September. This station will fill its usual Sunday afternoon hours each week. During the intervening weeks this station and its operating force will be occupied in carrying out certain research work designated to improve the quality of broadcasting from all radio stations.

Radio Station Conducting Tall Corn Contest

ONE of the most unique contests of the year is that being sponsored by Station WOC, at Davenport, Iowa.

This broadcasting station is often heard acclaiming proudly that it is located in Iowa, "The state where the tall corn grows." To exemplify the phrase and to justify the statement in the eyes of any who may be skeptical among its many visitors from other states, a tall glass case has been installed as a part of the station's unique furnishings, and in this case is to be displayed twenty stalks of Iowa's tallest corn.

To stimulate interest in intensive cultivation The Palmer School of Chiropractic has offered fifty dollars in prizes to the Iowa boys and girls who produce the twenty stalks with the greatest average height. Twenty-five dollars is to be paid to the first prize winner, fifteen dollars to the second, and ten dollars to the third.

At the end of the growing season contestants are to submit the average height of their twenty tallest stalks, measured from the ground line to the tip of the tassel. When the winners have been picked they will be notified to ship the corn (crated and with ears attached) to the Davenport station, where the measurements will be checked and the prizes awarded.

Any Iowa boy or girl under twenty years of age is eligible for entrance in the contest.

Capt. Miller Praises Radio for Balloons

IN the recent race four balloons carried radio. Captain Lester T. Miller has written the General Electric Company informally praising the radio set and its valuable use during the race.

"Lieut. Brown and myself during our flight found your set worked very satisfactory in every way," Capt. Miller writes. "As you know the counterpoise we used was a seven-strand copper wire, woven 15 times about our basket. For our aerial we used 300 feet of the same kind of wire. During the night of July 4 and on July 5 we flew at an altitude of about 4,000 feet. All our weather reports were received very clearly; in fact, the clearness of tones surprised both of us as they were clearer than our regular station sets on the ground.

"On July 5, after 8:30 a. m., we flew at a higher altitude and at heights of 5,000 feet and above we found that static was so bad that we were not able to receive satisfactory signals. We consider the set a very fine one and heartily recommend it for purposes of this kind."

Truth in Advertising

OVER $600,000 will be appropriated to further the "truth in advertising" campaign, it was announced at the annual meeting of the Executive Committee of the Advertising Association in Chicago last week. Of this amount $500,000 will be subscribed by forty Better Business Bureaus throughout the country and the rest will be appropriated by the Associated Advertising Clubs of the World.

"The results of advertising depend entirely on the impression that the reading public gets from advertising," said Paul Hunt, manager of the association. "Through the agency of the Associated Advertising Clubs of the World thirty-seven states and a number of municipalities have passed statutes requiring that all advertisements be true representations. We are now trying to get all of the states to pass such laws."

The meeting passed a resolution commending Postmaster General New for his activity and that of his department in helping to identify fraudulent advertisers.

RADIO FANS

Do you want to sell your old set?
Do you want to exchange anything for something?
Do you want to buy something?

If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

Try Radio World's Classified Department for your personal radio and other needs.

RADIO WORLD, 1493 Broadway, New York City

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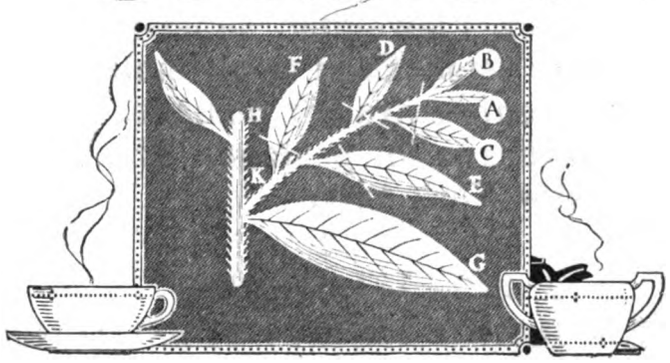
The A.B.C. of Good Tea



THIS diagram shows clearly one reason for the superior flavor, strength and aroma of RIDGWAYS TEA.

The plucking season commences in the early Spring and continues right into the Autumn. At the commencement of the season, the plant sends forth its first tiny shoots. In order to get the very choicest pickings, only those leaves marked "A," "B" and "C" are gathered for Ridgways. These tender, young tip-leaves give to Ridgways Tea that rare quality of flavor which distinguishes the famous Ridgway blends. The leaves marked "D," "E," "F" and "G" are coarser and less flavory and therefore *are never used by Ridgways.*

This carefully guarded Ridgway quality also assures more cups to the pound. When you buy Ridgways Tea you not only get the best tea, but actually more of it than is possible from inferior tea. As an example of rare good tea we suggest that you order Ridgways (GOLD LABEL), the *Genuine* Orange Pekoe.

Be Sure to Insist Upon

Ridgways Genuine Orange Pekoe Tea

A GENEROUS SAMPLE
WILL BE SENT ON REQUEST

Address: Ridgway Tea Co., Dept. A., 60 Warren St., New York

INDIA-CEYLON
Ridgways Tea

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Sleeper's Two Latest Radio Books

Two new and remarkably good radio books by M. B. Sleeper —one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a regenerative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for $1.00 and no extra charge for postage. The Columbia Print. 1493 Broadway, New York City.

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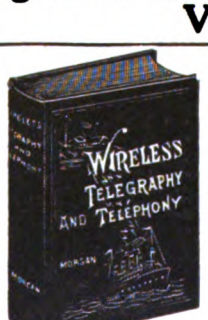
TO NEW RADIO WORLD SUBSCRIBERS:

Send $6.00 for yearly subscription for Radio World (52 numbers) and these two Sleeper Radio Books will be sent you free, parcel post prepaid. This offer good only until August 20, 1923. If you are already a subscriber, send $6.00 for a renewal and books will be sent you.

IF YOU ARE INTERESTED IN RADIO YOU NEED THESE BOOKS

Radio Books for Your Vacation

Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems



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Title Reg. U. S. Pat Off.

ILLUSTRATED EVERY WEEK

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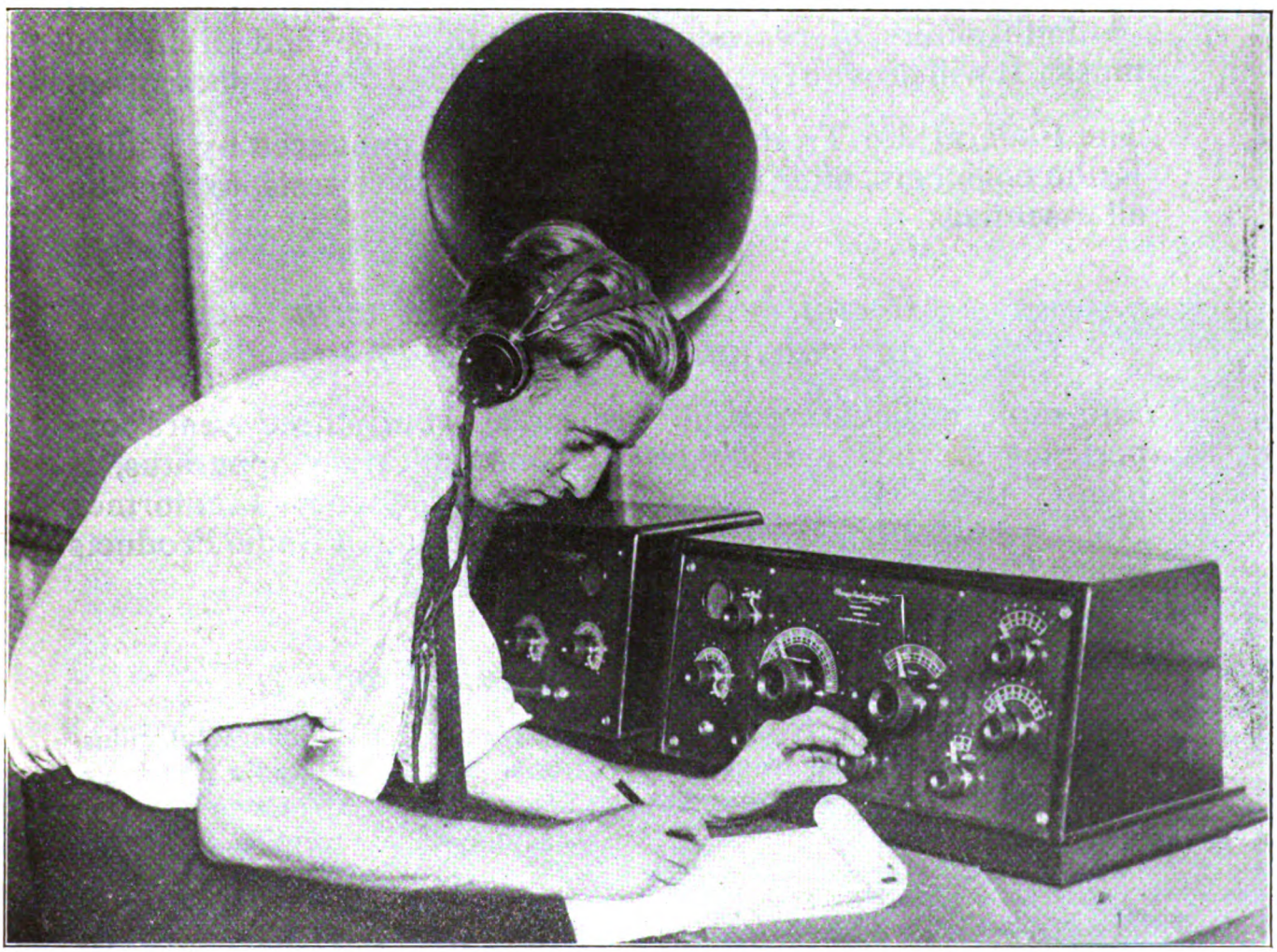

(C. Underwood & Underwood)

This picture shows D. F. Easthope at the receiving set at WJAZ, Zenith Edgewater Beach Station, Chicago, tuning in for signals from Captain MacMillan's ship, "Bowdoin," which is known as Station WNP, or Wireless North Pole.

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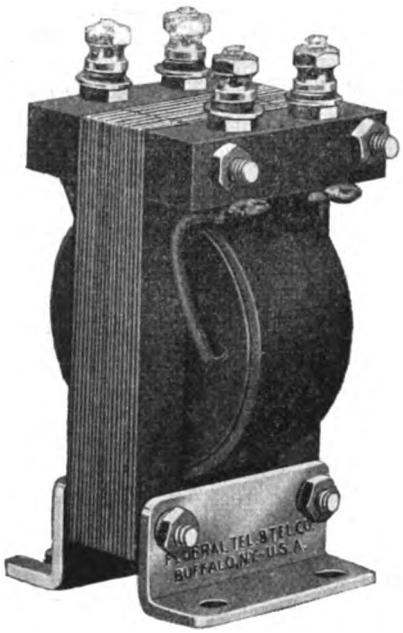

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VOLUME THREE OF

RADIO WORLD

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A New Electrical Phenomenon and Its Applications in Radio

By Dr. Alfred Gradenwitz

THE discovery of a decidedly new phenomenon by two Danish engineers, Knud Rahbek and Alfred Johnsen, a few years ago came as a surprise to those who, in the well explored realm of electricity, no longer expected any startling novelty to turn up. However, this phenomenon not only aroused

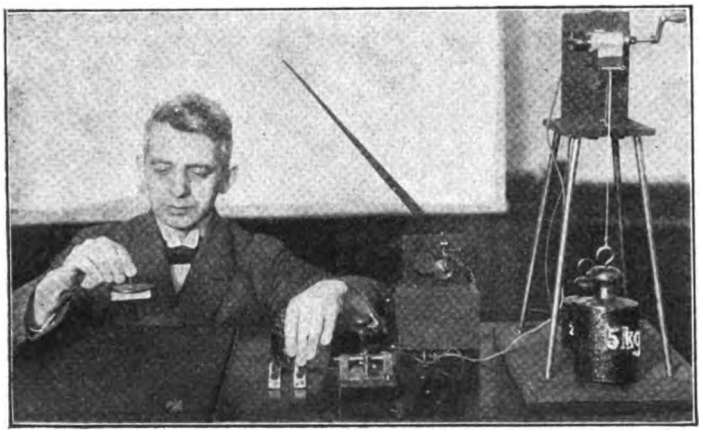

Fig. 1. Fundamental test of a new electrical phenomenon showing a metal plate clinging to a stone slab during the passage of a minute electric current.

the curiosity of those interested in the scientific side of the problem, but soon proved fruitful in remarkable applications to several branches of electrical engineering, most of all to radio telegraphy and telephony. Some of these applications which are the outcome of joint endeavors by the inventors and the Dr. Erich F. Huth Radio Company, of Berlin, are described in the following article.

The new phenomenon may be described as a powerful electrical attraction without any magnetism or iron and bids fair to oust the electro-magnet from its present monopoly in electrical industry. It is best illustrated by the following experiment:

An ordinary lithographic stone slab, 75 grams in weight, coated on one side with tin-foil, is, by means of a thin wire, connected to one of the terminals of an electric circuit, while the other terminal communicates with a brass plate placed on the opposite face of the stone. A feeble direct current is then found to flow through *the stone*, which, strange to say, *firmly clings to the metal plate*, in order immediately to be released, as the circuit is broken. The experimenter's own body can, instead of the wire, be used as conductor, thus illustrating the smallness of the electric current producing such strong effects. The plate may consist of any metal, or even of any non-metallic substance, provided that either this or the stone possesses some trace of electrical conductivity, which it, by the way, may receive by artificial means. An especially striking test consists of demonstrating the mutual attraction of two stone slabs.

In order to understand the above phenomenon, it will be well to remember that the stone slab and metal plate together constitute an electrical condenser. The stone being polished as smooth as possible, their distance in the case of what seems to be actual contact is 1/100 to 1/200 millimeter. Now, as the effect of a condenser, of course, is the stronger as the two armatures come closer together, this system is bound to exert exceptionally strong effects. Moreover, the arrangement opposes to the electric current a truly enormous resistance—in one case as much as 20 million ohms, that is, a figure so high as to make any line resistance appear negligible. It will, therefore, be understood that the current allowed to pass through the system should be quite minimal, in fact of the order of a millionth ampere. This is how a very strong attraction is produced by a current of striking smallness.

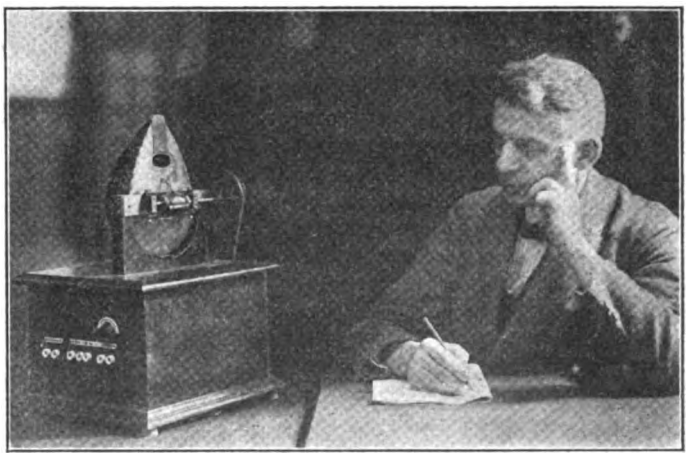

Fig. 2. A mandolin converted into a loud speaker, utilizing the principle illustrated in Fig. 1.

Being present with equal intensity in any metal, and, it seems, in most non-metallic substances, the phenomenon is much more universal than electro-magnetism. Another striking advantage is the well-nigh incredibly small energy consumption, the amount of energy required to lift a given weight being, in the case of the new phenomenon, 300-500 *times less than in connection with an electro-magnet.*

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Even much stronger effects are obtained by using a *stone cylinder* in the place of a slab. One especially striking experiment shows less than 1/10 watt to be expended in retaining a weight of 5 kilograms. This, however, is one three-hundredth part of the electrical energy used up by a standard 25 candle-power incandescent lamp.

Unheard-of vistas are opened up by this new electrical phenomenon. The first application was to the construction of a call relay of unusual sensitiveness,

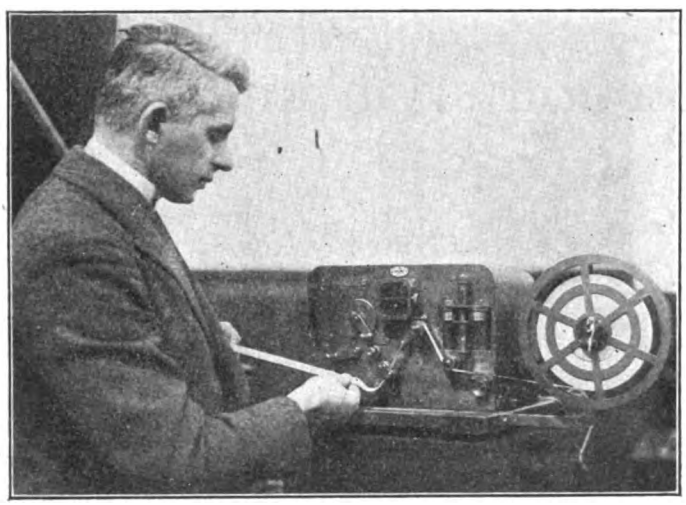

Fig. 3. Huth high-speed telegraph recorder comprising the new relay described in the accompanying article.

actuated by a current of about one millionth of an ampere. Some promising uses of this remarkable relay are enumerated in the following:

RADIO TELEPHONY FROM AND TO RAILWAY TRAINS—Messrs. Huth have on the Berlin-Hamburg railway line developed this system to such a point that any subscriber to the Berlin and Hamburg telephone systems may put himself in connection with travellers in the train, and vice versa. Electrical waves of moderate length, though low energy, generated at one of the terminal stations, are transmitted to the conductor lines serving for ordinary telegraphy and telephony along the railway track. The train carries on the roof of one or more cars a very low antenna in the form of a few wires insulated from and stretched out close to the car roof. This antenna is connected up to a small radio telephone transmitter and receiver of a few watts and is used simultaneously for talking and listening. The traveller, of course, uses an ordinary telephone, such as he is in the habit of employing at home. Inasmuch as the electric currents reaching the train or starting from it are rather weak, a most sensitive relay was required to actuate the call bell or call lamp at both ends and this is where the new relay came in very handy.

HIGH FREQUENCY TELEPHONY AND TELEGRAPHY OVER HIGH TENSION CONDUCTORS—The same system of directed radio ("wired wireless") has lately come into extensive use in connection with power plants, allowing as it does communication to be established at a moment's notice, e. g., between the generating station and its sub-stations in case of breakdown, without resorting to any special telephone line, the electric waves travelling along the high tension conductors. Such apparatus using the new sensitive relays have been installed in a number of great power plants in Germany and Switzerland, while the same possibility of "wired wireless" of course, exists in the case of ordinary telegraph or telephone lines.

NORMAL RADIO TELEGRAPHY AND TELEPHONY—There are many possibilities in store for the new relay even in normal radio telephony and telegraphy, e. g., for calling up ships in the same manner as in the case of wired telephony, so that on small steamers, the services of a permanent telegraphist can be dispensed with. Ships in case of danger can be warned automatically.

HIGH SPEED TELEGRAPH RECORDERS—Apart from the relay using stone slabs and metal plates, the Huth company have developed apparatus comprising cylindrical stones or metal conductors. (In such cases it is generally the stone which has the form of a cylinder.) The first apparatus of this kind is a high speed telegraph apparatus able to record or retransmit Morse signals at enormous speeds, though with extremely small telegraph currents (1/100,000 amp.), the line resistance thus being of no importance. Extraordinarily thin wires (with a corresponding saving of material) can accordingly be adopted and, moreover, the speed of working can be raised to figures so far inaccessible (2000 letters per minute), without any prejudice to the distinctness of type, both in wired and wireless telegraphy.

Another interesting application is to the construction of loud-speaking telephones, where the stone cylinder system actuates a membrane in accordance with fluctuations of the current supplied. It is expected to arrange for a broadcasting service enabling any telephone subscriber at given hours to treat his

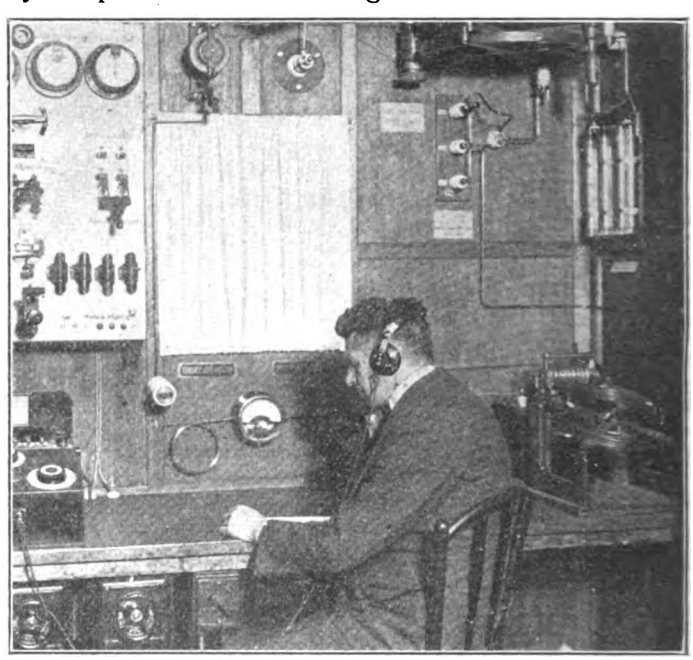

Fig. 4. Ship radio-telephone station designed on the new principle described herewith.

guests either to classical or to dancing music. Wireless transmission of speech and music has recently been effected with a 1 KW transmitter designed on the Huth system between the premises of the firm and places in Sweden, in the Isle of Borkum, in Rotterdam and elsewhere.

There are many other devices based on the use of the new relay, which have already got beyond the experimental stage, e. g., talking films, electrically operated typewriters, and others.

It Doesn't Hurt

IT doesn't hurt anyone to ask for information. They say advice is cheap. It may be cheap, but it is not always sought. If you have some problem that you are not absolutely sure about, it is better to ask questions than to do it wrong.

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Making and Using the Buzzer Test

By Thomas Brainard

THERE are many times when we are not quite certain whether our receiving tube is in its most sensitive condition, or when our crystal has its most sensitive adjustment. Especially is this true when there are no stations sending for the moment. Of course, we can guess, but the only way to be really sure is to use some sort of an external exciter, such as a buzzer test outfit. The little arrangement and outfit to be described can be made for a very small sum, and besides performing the function mentioned, may be used for several other useful purposes, such as for testing circuits, exciting a wave meter and so on.

A buzzer test may be easily fitted to sets that have already been built; in most cases without marring the appearance in the least, and with little trouble. Let us take first an ordinary tube set, with a variocoupler mounted near the left hand end of the cabinet. If there are two inches or more between the coil and the wood end, the task will be comparatively easy. The parts that are needed include a flush type push button; a small three-cell flashlight battery; a small high frequency buzzer; and the necessary connecting wire and mounting screws. A strip of brass, about ½-inch wide and four inches long, will be needed for making a bracket to hold the battery in position.

Near the upper left hand corner of the panel, a hole should be drilled for the push button. For the ordinary flush button this should be about a ⅝-inch hole. If you have a drill large enough, you can make this hole yourself, or you may take it to a shop where they do such work. If neither of these methods are convenient, a fairly satisfactory hole may be made by drilling a series of small holes in the form of a ⅝-inch circle, and then smoothing down the ragged edges with a file. Be sure and mark the hole out with a compass, however, and keep the outside rim of the small holes within the line. Two small holes must be drilled for the fastening. These must be tapped, if they do not go all the way through the panel. You can get a small tap for this purpose for about 10 or 15 cents.

The buzzer may be mounted on a small shelf that has been fastened on the back of the panel; or, more easily, mount it on the inside of the wood end piece of the cabinet. This latter is probably the best way, for the buzzer could be kept farther away from the coupler coil. Brass screws should always be used for fastening. Fasten the buzzer at a sufficient height to allow for the mounting of the flashlight battery directly underneath. All of these instruments are kept as near the left hand end of the cabinet, and as far from the coil as possible, so that these metal parts will not appreciably interfere with the oscillating circuits.

Now the brass strip should be bent as shown, and of a shape so that it will fit snugly over the flashlight battery. A hole for a screw should be drilled in each end. After this is done it may be fastened to the cabinet, with the battery in place.

Next the wiring may be done. Most any wire will do. Ordinary bell, or annunciator wire will serve very well. Connect as shown in the circuit diagram. It is best to solder the connections on the battery terminals. The other connections you do not have to be so particular with.

About an eighth of an inch from the top of coupler winding, wind two turns of the bell wire, or some more flexible wire; and anchor it in place with some insulating varnish. This serves as a coupling coil with the coupler winding. Connect one end of this little coil to one of the terminals of the push button; the other terminal of the push button to one of the buzzer terminals; the remaining buzzer terminal to one pole of the battery; and the other pole of the battery should be connected to the free end of the little coil.

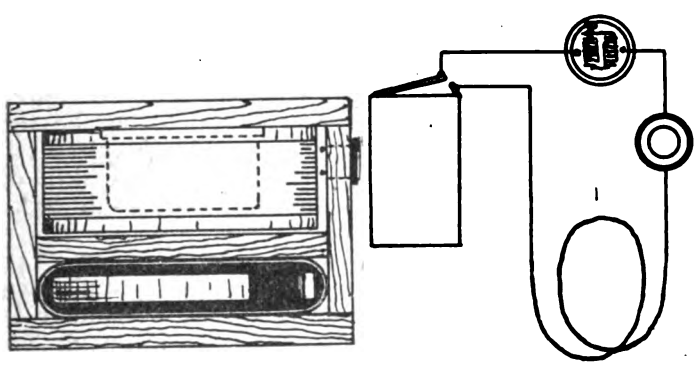

Fig. 1. Construction of a handy buzzer test and circuit diagram of connections used. A single turn of wire around the coupler or tuner is sufficient.

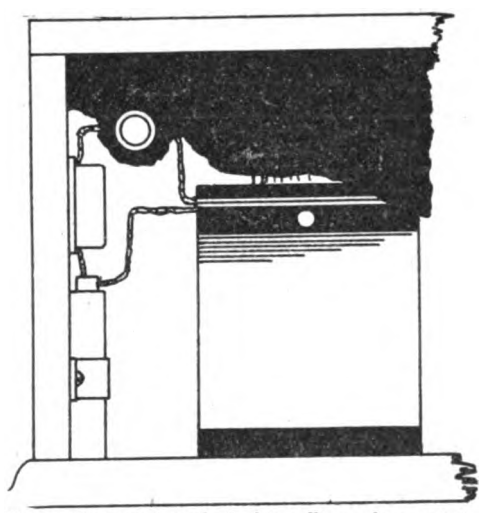

Fig. 2. Suggested method of installing a buzzer test in a cabinet set. This is the preferred method if there is room in the cabinet for the installation.

The buzzer test could be hooked up with a loose coupler set in precisely the same way, except that the little coil would in such a case be vertical; or in other words the coil should be on the same plane as the coupler coil, regardless of whatever position that may be in.

If you do not care to mount the test outfit directly on your set, you may make up a very neat little outfit that may be used whenever and wherever wanted, by mounting the necessary parts in a small box, as shown in one of the drawings. The box should be about 3½ inches deep, 3¼ inches long, and two inches wide—inside measurements. However, the exact size should depend primarily upon the parts which you are able to obtain. The stock for the box, if you intend to make it yourself, could well be ⅜-inch.

Secure a cardboard tube, three inches in diameter and about one inch long, and wind it with about ten turns of No. 22 wire. Then mount the tube in one end of the box, as shown. In the center of this coil, to save

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How to Make a Two-Stage Radio-Frequency Amplifying Set for $11.00

By A. E. Herron

WITH the ever-increasing use of radio-frequency amplification for long distance reception a great deal of attention has been paid to this phase of radio engineering by experimenters.

There are several methods in use with various modifications for obtaining radio-frequency amplification depending on the way the tubes are intercoupled.

The tubes may be intercoupled in the most simple and inexpensive way by using tapped coils having both primary and secondary windings. These windings should be tightly coupled and both the primary and secondary should have taps as a means of tuning. This arrangement does not necessitate great operating skill. Each plate circuit can be individually tuned by means of the taps. The efficiency of this type of amplifying set is very high because as each plate circuit is made resonant to the incoming wave a maximum signal strength will be obtained at the output.

The important point in the design of the set is the construction of the tapped coils. The size of the forms

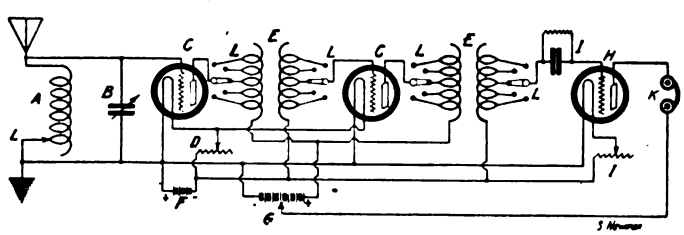

Fig. 1. Circuit diagram of the two-stage radio-frequency set with detector. A—Tuner. B—11 plate variable condenser. C—Amplifying tubes. D—Amplifying circuit rheostats. E—Specially constructed radio-frequency amplifying coils. F—A Battery. G—B battery. H—Detector tube. I—Grid leak and condenser. J—Detector rheostat. K—Phones. L—Switch arms for varying inductance of radio-frequency coils.

is the same for both coils, that is for the first and the second stage. These forms are 4″ in diameter by 2½″ long. The winding should be commenced at one end of the form. When 10 turns have been wound a tap is taken off, but instead of the tap being brought out on top of the form, a hole is drilled through at the point where the tap is taken off and the tap brought out from the inside of the form or tube. The reason for this is the taps will not have to be brought out through the secondary winding, thereby preventing a short circuit between the primary and secondary windings.

The winding is continued and taps taken off every five turns, instead of 10, until 50 turns have been wound. Over this a layer of waxed paper is wrapped before the secondary winding is started. When the waxed paper has been neatly put on and trimmed the secondary coil is started over the primary. It should be wound in the same direction as the primary and taps taken off as before, only these are brought out on the top or outside of the coil instead of inside. Both the coils for the first and second stage of amplification are made the same size and wound in the same manner and the same number of taps is brought out.

The wire for this purpose should preferably be Litzendraght, but if this is not obtainable No. 24 or 26 double cotton covered wire may be used and good results will be obtained. When both coils are neatly wound they should be shellaced and baked until they are dry. Care should be taken when drying or baking them as they are liable to burn if placed in too hot an oven. The form or tube should be of bakelite or condensite, or any other good insulation. Fibre or cardboard tubing should not be used on account of the poor insulating qualities of both. For mounting these coils two holes near the edges should be drilled. These should be large enough for an eight-thirty-second screw to go through. These coils should be mounted at right angles to each other and should not be too close as they are liable to interfere with the circuit if mounted too close to each other. No great skill or experience is needed to make these coils—no more than in making a tuning coil.

The aerial tuning part of the set consists of a specially wound tuning coil and a variable condenser. The tuning coil may be made in the same manner as any other coil or the primary of a variocoupler for instance. Taps are brought out every fifth turn. Fifty turns will complete the winding. When it is completed it should also be shellaced and baked in an oven until thoroughly dry.

The next step is the construction of the grid condenser which is the most important part of any tube set and yet the most frequently neglected. The condenser consists of two sheets of tinfoil ¾″x1″, a sheet of waxed paper 1¼″x4″, two pieces of copper strip or copper foil ⅛″ or ¼″ wide by 2″ long, two pieces of sheet bakelite or condensite ⅛″x½″x2″, two 8-32 screws with nuts and washers. To assemble the parts first bend and fold the waxed paper about one inch from the end, insert the tinfoil between the folded sheets and place the copper strip next to the tinfoil. Let the end of the copper strip with the hole in protrude about a half-inch beyond the waxed paper at one end. Bend and fold the waxed paper once more in the same way, place the second sheet of tinfoil and copper strip as before. Let the copper strip stick out the same distance but at the opposite end from the first one. Fold the paper again over the tinfoil and around until all the paper is wrapped around the whole

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space, may be mounted the buzzer. A partition is made down the center of the box—or, rather, a little to one side—so that the battery will just fit in snugly; or else a clamp as before described may be used. The wiring is exactly the same as with the other outfit. It will be noticed that the push button is mounted on one side of the box. A cover for the apparatus is not shown, but should be used to protect the interior from dust and dirt.

By including a set of two binding posts in the circuit—ordinarily short-circuited—the outfit may be used for testing circuits, coils, condensers, etc.

To use this box affair, it should be so placed in relationship to the primary coil of your set, that its own coil is in the same plane. Then, when the button is pressed, current will be induced in the primary coil, and from there into the secondary; and by using these high frequency buzzers instead of the uncertain incoming radio waves, the detector may be adjusted without any trouble.

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thing. The copper strip should have a hole drilled at one end to take an 8-32 screw. Drill a hole at each end of the bakelite pieces about 1½" apart, place the condenser carefully between the two pieces of bakelite and bend the two flaps of the copper strip at either end until the holes in the strips are right over the holes in the bakelite pieces. It may be necessary to pull the strips out a little. Insert the screws and put washers and nuts in place and the condenser is made ready for mounting in the set.

The necessary parts for making this set, with average prices, are as follows:

¾ lb. No. 24 or 26 D. C. C. magnet wire	$1.00
2 2½" long, 4" in diameter tubes, bakelite	.50
1 3" long, 4" in diameter tube for tuning coil	.25
3 standard valve sockets	1.05
2 rheostats	1.50
1 panel, 10"x7"x⅛, bakelite	1.40
5 switch arms and knobs	1.25
1 eleven-plate variable condenser	1.15
51 switch points	1.02
10 switch stops	.40
2 brackets	.25
9 binding posts	.45
Miscellaneous (connecting wire, screws and nuts)	.72
Total cost	$11.00

WD-11 tubes may be used, but this will necessitate the buying of adapters. WD-12 tubes should be used as these are made for the standard socket.

If WD-11 tubes are already on hand, instead of buying the standard sockets WD-11 tube sockets should be bought. This set has been tried out only with UV-201 and UV-201A tubes for the radio-frequency amplification and UV-200 for the detector, but WD-11 or WD-12 tubes should give good results. A potentiometer is not really necessary but slightly finer adjustment will be obtained by its use. The grid leak is made by drawing a pencil line between the two screws on the grid condenser. This line may have to be varied with different makes of tubes, but this is an easy matter, erasing the line or by making it heavier with a pencil. The parts may either be mounted on a piece of board or in a more elaborate affair, consisting of a panel and cabinet. Before the parts are mounted on the panel the panel should be all laid out and drilled.

Every part should be securely fastened to the panel so there will be no fear of any of the parts getting loose when operating the set. It is essential to bear in mind the necessity of keeping the leads running to the plates and grids of each tube as short as possible. Precaution should be taken in placing the parts and in making other wiring connections as short as possible so that the wires are kept as far apart from each other as can be. A short wave amplifying set is very critical and unless these precautions are taken it will be impossible to get results such as could be got had the set been properly wired. Short wave amplifying sets usually depend more for their successful operation on the care taken in building the set than in the use of good parts incorrectly assembled and wired. There is comparatively little difference in the efficiency between this set and a transformer coupled radio-frequency receiver.

The tools necessary for the construction of this set are as follows: screw driver, brace with the necessary drills, a pair of compasses or dividers, and a soldering set. All connections should be well scraped and cleaned before soldering. If soldering paste is used it should be well wiped off from all connections after finishing soldering. Spaghetti tubing should be used on all wires where they cross each other or those that are liable to touch each other if the set is accidently given a jar. There are two wires in each tap leading from both the radio-frequency coils and the tuning coil. These two wires should be securely soldered together and to the switch point, because if they are not, an open circuit in the coil will be the result.

This set is very easily tuned. When first tuning, the switch arms should be left on the fiftieth turn or in other words at maximum on the radio-frequency coils on both primary and secondary. When this is done the aerial circuit should be tuned by means of the tuning coil and the variable condenser which is connected in shunt with it. If signals are not heard the adjustments on the radio-frequency coils should be changed and the aerial circuit tuned all over again as before. The tuning should be first tried out on a nearby station; this will give one an idea roughly just what adjustments are necessary for the broadcasting wave lengths. Care should be taken when tuning this set as it is rather sharp, and if the dial on the variable condenser is rotated too rapidly it might mean the missing of the more distant stations. This radio-frequency set gave excellent results with an outside aerial, but good results should be obtained by using this set with a loop aerial, provided at least two stages of audio-frequency amplification are used.

Audio-frequency has not been tried out with this set, but one stage should be sufficient if telephones alone are expected to be used and the set connected to an outside aerial. A 90 volt "B" battery as the plate potential was found to be sufficient. Of course, as much as 135 volts could be used.

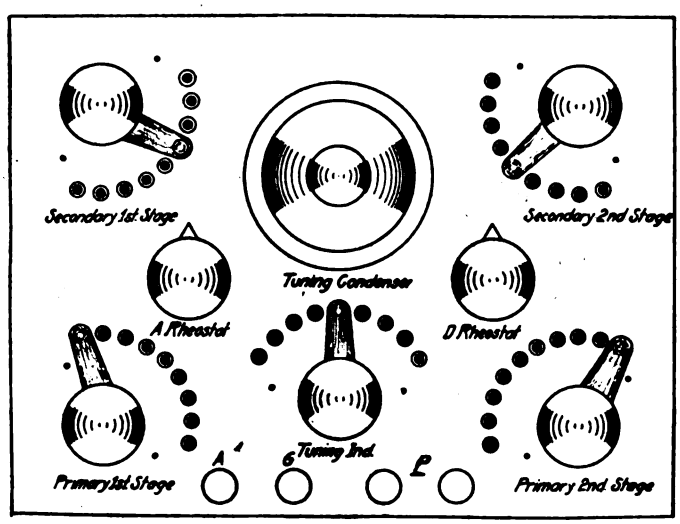

Fig. 2. Suggested panel layout for the receiver described. The antenna, ground and phone posts are located on the front of the cabinet, but for convenience the A and B battery posts are on the rear of the cabinet.

In my experience with radio I have found that this is the least expensive two-stage radio-frequency outfit that can be built and yet give results almost equal to any high priced outfit. If the set is laid out as shown in the diagram, and mounted in a cabinet, it will look as good as any factory made set. The panel could be sandpapered and given a dull finish. This will help to show the knobs and dial much better and give a more pleasing effect to the eye.

Four binding posts are mounted on the outside of the panel. These are: aerial, ground, and two for the telephones. The battery binding posts are mounted on the back of the set on a piece of bakelite or condensite ⅛"x¾"x6". These should be marked so that there will be no danger of connecting the "B" battery in place of the "A" battery and burning out the filaments of the vacuum tubes. Any one building this type of set can be assured that he will own a set worth having for both appearance and results.

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How to Read "Radio World" Profitably

By Stephen L. Coles

IT is generally admitted that there is considerable science and a great deal of hard work involved in editing and publishing a weekly journal of any kind. When a weekly requires the important added elements of technical accuracy and a sincere desire to represent broadly the industry with which it is affiliated, other burdens are added. Many years are usually required to so perfect men in this kind of work that they may be competent properly to fill their jobs.

In the course of performing their tasks day by day and week by week it is only to be expected that the editorial staff of a weekly such as RADIO WORLD should acquire an accurate, intimate knowledge of the industry it represents. This may come in various forms; such, for instance, as voluminous correspondence relating to every possible phase of the radio industry. The questions answered in print are but a fraction of the questions asked. Some of these are answered by telephone, some by mail, and others are referred to college professors, engineers, manufacturers or specialists in the line regarding which the inquiry is made. Then, too, it would surprise the average reader to know how much information is derived from the advertising copy received in the business department. The editors frequently are asked to pass upon statements made by advertisers.

The editorial offices of RADIO WORLD seem to be a natural focal point at which gather the many and varied lines of information, to be again reflected to the world by the editorial staff.

To take up only one instance, reference is made to a column which has been appearing in RADIO WORLD for a number of weeks. "Radio Literature Wanted" is its title, and it contains simply names and addresses of people from all over the world. Yet back of these names is an important human interest story which possesses at the same time many elements of great practical business value. These names come to RADIO WORLD through the mail and are sent voluntarily by the people themselves. All of them have a sincere desire to gain information of one kind or another—or they would not take the trouble to write. Every one of them is a potential and quite probable buyer of radio goods. Some of them are only boys, but any wise merchant will tell you that if he can secure the trade of boys and serve them satisfactorily he will build up a business which will last during their entire lives.

This is well exemplified in the hobby of collecting postage stamps. Nearly every one of the prominent philatelists of today began collecting postage stamps as a boy. Many fortunes have been made by dealers in stamps and their business even now is particularly with the younger generation.

The attractions of radio for the young boy have never been exceeded by any form of constructive enjoyment in the history of time. Most of the inventors of radio devices and nearly all the high-class operators began as boys. Here is a field pregnant with immense possibilities for the manufacturer who will carefully and intelligently cultivate it.

That the manufacturer, dealer and distributor of radio supplies is not getting the most possible, nor half of it, out of this wonderfully fallow field has been amply demonstrated to RADIO WORLD through this little column of names. At various times and frequently the names of members of its staff have been inserted in this column so as to find out just how the people to whom these names should be most valuable were responding. The sum and substance of a two months' test is that full advantage of this opportunity is not being utilized. The particular fault seems to be that business men in the radio industry are not properly equipped with printed matter, catalogs and price lists with which to respond to these requests. Many of them have nothing of the kind and send in response to requests handwritten postal cards, typewritten postal cards, badly mimeographed sheets and poorly printed, out-of-date leaflets. One of the largest manufacturers in the industry responded to a request for literature with an envelope which contained nothing when it was received. Of course, this instance probably was a clerical error, but the effect on the recipient was just as unfortunate as if the episode had been clearly thought out and an insult intended.

Advertising, of course, is the basis for success in any business that manufactures reliable goods at a fair price. Advertising obviously includes printed matter with which to respond to requests for information. It would be well for radio business men to call in outside help and provide themselves with printed material of a kind and character that properly will back up their publicity of various sorts and eventually bring business.

Readers should learn to read and benefit by the publications for which they spend money. Every radio business man should, either himself or have someone for him, carefully read RADIO WORLD each week with the sole purpose in view of taking prompt advantage for himself of the wealth of information it contains—a large part of which can be turned into dollars and cents.

Radio in a Cigar Box

(C. Photonews)

Felian Garzia and his cigar box Flewelling receiver. This set has both A and B batteries, vacuum tube, and four head phones, so arranged that four people may comfortably listen in. The entire set is contained in a regulation cigar box, and weighs less than five pounds. Tuning is accomplished by the use of the rubber end of a lead pencil against the condenser plates.

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RADIO PRIMER

By Lynn Brooks

WHAT TO BUY—Many times when a particular article attracts the notice of a fan who is constructively bent, he puzzles and frowns when it comes to the act of buying the goods.

He will complain about the fact that the writer does not specify any particular make of material. He knows that there are fifteen or twenty audio-frequency transformers on the market as well as hundreds of makes of other apparatus. What can he do? What does he do? One of two things. He either lets his pocketbook dictate the apparatus, or else he writes a long letter to the author or the editor and asks a lot of questions.

Take your dealer into your confidence and if he is a good business man he will recommend a particular type of apparatus that he thinks is good. How does he know? Well, he is selling them and he knows what sells well and that is what he is going to give you.

Never let your pocketbook dictate apparatus. If you cannot afford the very best, wait a week or two until you can. You can never gain anything by scrimping. In radio just as in anything else the article is worth just what you pay for it. Sometimes it is worth considerably less, and this is generally the case with cheap apparatus. You pay less and you get considerably less than you paid.

Because it is cheap in price does not signify that it is good in quality, even though you may run across a bargain every once in a great while.

WHAT CIRCUIT TO USE—When it comes right down to the final analysis it is a pretty tough job for the uninitiated to pick the best circuit to work with. There are so many that crop up every day, every week, every month, each claiming its advantages over all the predecessors, that it is a tough problem to choose among them.

One of the greatest mistakes that an amateur can make is to tackle the more intricate circuits. There is always some little detail that he will not understand and cannot figure out.

Roughly, we can classify tube circuits into two classes: The single circuit receivers and the double circuit receivers. They each have their advantages and their disadvantages, and their relative capabilities and incapabilities.

The single circuit receivers are simple to construct and tune. They have great volume and fairly sharp tuning. Most of them can be easily constructed from few parts in a couple of hours' time, if care is taken. They are simple to work, as they generally have but one or two controls.

Their disadvantage is that if they are of the regenerative type they will re-radiate, due to their being powerful oscillators. This will cause a great amount of disturbance to neighboring sets if they are not handled correctly. They cannot tune out interference as well as the double circuit sets, and for that reason it is more than likely that distance work when a local station is on will be impossible. Their salvation, however, lies in the enormous volume of which they are capable.

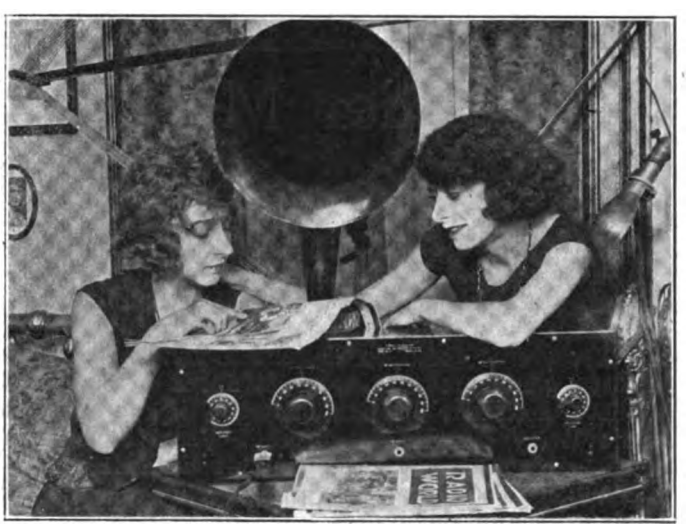
The double circuit sets are far more intricate of construction and the controls are tripled in most cases, as besides the coupling and other controls there is generally a primary inductance control. However, their selectivity is far greater than the single circuit, and finer tuning is possible, eliminating to a great extent the interference noticed in single circuit sets. The range of a double circuit set compared with a single circuit set is about even, as both are capable of doing excellent work, the only drawback being that it takes more care and experience in the construction and operation of the double circuits than the single circuits, and therefore the beginner most always goes to the simpler sets.

Any circuit, whether crystal or six tube regenerator, requires care both in operation and construction if good results are to be expected.

The Radio Woman

I HAVE received the following interesting letter which I am glad to publish in the hope that it will inspire others:

"In RADIO WORLD for July 14, 1923, you published our photograph under the heading, 'Winners of non-stop radio golf contest,' but neglected to publish our names with it. We feel highly honored in having our picture published in RADIO WORLD and we are requesting that you publish our names in another issue, using the photo attached herewith or in any way you see fit. You know, Mr. Editor, that it is no 'cinch' to cover



Winners of the recent six-day non-stop radio golf contest and enthusiastic readers of RADIO WORLD. On the left, Miss Violet Vee, and on the right Miss Valerie Vee, both of New York City.

132,000 miles by radio and we are somewhat proud of our record and challenge anyone to beat us.

"It might be interesting to state here that we have been radio fans for some time (our first set being a simple crystal set), and also that we have been readers of RADIO WORLD from almost the first issue. We congratulate you for turning out such a splendid radio publication and thank you for publishing our picture. —Valerie Vee, Violet Vee."

Safety First With Tubes

DO you realize that for a few extra pennies you can safeguard your tubes and prevent them from blowing out? It is very easy. All that is necessary is two of the small flat fuses such as are used by the telephone company to safeguard the transformers. They only cost a few pennies apiece, and will stand watch over your tubes, and you do not have to worry when you are away for fear that someone will unknowingly blow your tubes and cost you money to get the set working again.

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Receivers Recommended for North Pole Messages

HARTFORD, CONN.—With the coming of each radio season, particularly in the early fall, the radio amateur prepares for greater distance in receiving and transmission and those who were content last year to tune in distant broadcast stations are now preparing their equipment and lifting their antenna another notch or two for the purpose of listening in for Wireless North Pole, Donald MacMillan's radio in the Arctic.

This new extension of the amateur's prospective range, along with the novelty of hearing code dispatches from the polar exploration party, has prompted many amateurs to ask what receiving equipment is best for reception of messages from WNP.

Basing his opinion on the inspection of a large number of reports and experiments by amateurs who are putting much time and money on this very problem, Howard F. Mason, department editor of "QST," published by the American Radio Relay League, which furnished a radio operator for the Arctic ship, advises listeners to install either a regenerative receiver with one stage of audio amplification or a superheterodyne with tuned radio amplification using the "neutrodyne principle" in the amplifier.

"As WNP is sending on amateur waves, the receivers that have been adopted by the majority of A. R. R. L. relay stations will be the most practical to use in picking up messages from the Pole," Mr. Mason believes. "The regenerative set with one stage audio is still popular. It is being improved over the older models by using coils and condensers especially designed to minimize losses.

"The superheterodyne, which has been always the ultimate in a receiver for short waves, has been reduced to a more practical basis this season than last, owing to the advent of the 'neutralizing' feature, by Professor Hazeltine, and by the new type of tubes recently placed on the market. These consume small amounts of filament current and do away with the necessity of having a large storage battery."

Weather Maps Aid Amateurs to Foretell Radio Reception

MINNEAPOLIS, MINN.—Radio fans may have to add a barometer to their equipment and study maps issued by the weather bureau to determine their range of transmission or reception if the theory that radio waves tend to follow isobars, or lines of equal pressure area, advanced by Donald C. Wallace, assistant division manager of the American Radio Relay League, is correct. From experiments made at his amateur station in this city, Mr. Wallace is convinced that radio reception may be foretold with a fair degree of reliability.

The subject is comparatively new and the most that can be said for it is that it makes a start at explaining why reception is poor at certain times and why stations at various points of the compass are heard with changing strength regardless of their actual distance. "If a daily weather map is used," says Mr. Wallace, "it will be found that not only do waves tend to follow the lines of equal pressure, but the range of one's set can be determined some hours in advance.

"Recently a striking example of the effect of these high and low pressure areas occurred. A tornado passed through Louisiana making a low pressure area, while in the northern part of the country there were no disturbances and a high pressure area existed. Radio fans heard nothing more than 100 miles distant.

"Sometimes signals take a round-about course and follow the isobars, and in this case, marked fading exists. This is due to the fluctuation at the edge of the high pressure area that exists in between. On some nights the whole country has the same barometric pressure, and on those nights, stations from all sides come in. The Mississippi Valley often has the same barometric pressure; thus signals north and south are apt to be consistently loud while they vary east and west where barometric differences are greater."

Let Strange Wires Alone!

A LETTER has reached RADIO WORLD from the engineer of a western power and lighting plant, telling how a young radio enthusiast was nearly killed. It is designed as a warning to all well-meaning young men who see an opportunity of using a wire for an antenna, without first considering just what that wire is.

This young follower of radio was prevented from erecting an antenna because of the fact that the neighbors on both sides of his house objected to his stringing the wire on their property. As there was an electric light pole outside his house, and about 20 feet from his bedroom window, he climbed the pole, insulated wire in hand, and attached the wire to the incoming side of the transformer, or the side that delivers 110 volts. As the wood was dry and he was wearing rubber soled shoes, nothing happened. He threw his wire across the lawn, and later attached it to a string, preparatory to hauling it in his window. As he pulled the wire it crossed the high tension side of the transformer. He had just touched the wire when there was a flash, and that whole section of the town went dark. He went to the hospital, badly burned, and crippled on his right side for life, but lucky to be alive. The supply was 20,000 volts—enough to kill him instantly had he made good contact.

This should be a warning to many fans who are tempted to string their antenna across the nearest light pole, or attach it to some handy and convenient wire that is already strung up. Don't do it!

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Washington Now Has Two Powerful Broadcasting Stations

By Carl H. Butman

WASHINGTON, D. C.—Radio fans in the Nation's Capital are agog with interest in the two new Class B broadcasting stations, WCAP and WRC. Enthusiasts, even several hundred miles from Washington, are beginning to listen in to the high class entertainment from a new radio center. It has been an army and naval radio center for some time but good, private broadcasting has been scarce.

Recently WCAP, of the Chesapeake and Potomac Telephone Company, went on the air, broadcasting a duplicate of WEAF's program in New York. The telephone company's first strictly local effort was the broadcasting of the U. S. Marine Band, which brought in many enthusiastic returns. WCAP was included in the six stations which were to have broadcast President Harding's speech at San Francisco on July 31, connection to be made by telephone wires from the Pacific Coast to their transmitters. Within a month, it is understood, WCAP will be sending a regular program, dividing the time with WRC on 469 meters.

On August 1, WRC, the new station of the Radio Corporation, named the "Voice of the Capital," was christened at 8:00 p. m. Its regular programs will be broadcast Tuesday, Thursday, Saturday and Sunday afternoons, and Monday, Wednesday and Friday evenings, the telephone company's station WCAP broadcasting the alternate evenings and afternoons.

Col. Theodore Roosevelt, Assistant Secretary of the Navy, made a speech at the dedication of the new Radio Corporation's station on Wednesday last. Major Gen. John L. Hines, Deputy Chief of Staff, U. S. A., spoke for the army, while Acting Secretary of Commerce S. B. Davis talked on commercial and public interest in radio.

The opening ceremonies of WRC included a radio message from General Harboard, president of the corporation, who is abroad; talks by David Sarnoff, general manager, and Dr. Alfred Goldsmith, in charge of radio research.

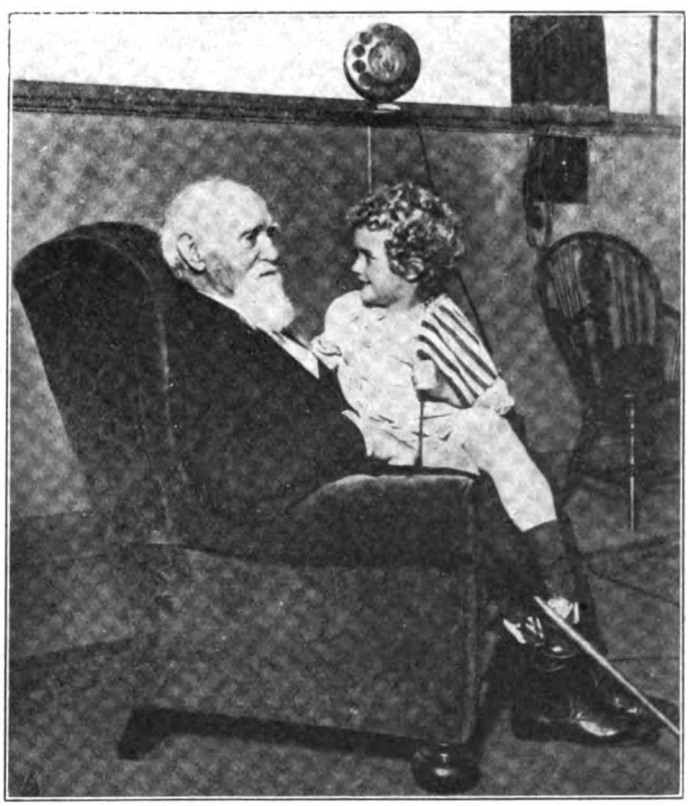
The initial program arranged by Mr. Ralph Edmunds of WRC, was not to be entirely devoted to talks, however, as special musical numbers were broadcast by the U. S. Marine Band, Taylor Bronson leading. Celebrated artists on the program, including Charles C. Tittman, bass soloist; Elias Breeskin, Russian violinist; Ruth Peter, soprano; Victor Golibart, tenor, and Clelia Fioravanti, mezzo-soprano.

WRC has been described technically already; it is a duplicate of the corporation's stations in New York and is rated at 500 watts. Having two sets of apparatus, however, it could in an emergency put out 1000 watts and reach every corner of the continent. Every precaution is taken to insure excellent broadcasting, from the especially sound and echo-proof station, where the artists perform, to the small receiving set on which the operator listens in to his own station and for distress calls from ships with which the broadcasting might interfere.

The new station is under the personal direction of Mr. S. P. Guthrie, superintendent of the Washington District. Mr. W. L. Tesch is local engineer, assisted by Operators Oliver and Rundquist. Mr. Ralph Edmunds is program manager, and is assisted by Announcers Gannon and Berkeley. On opening night Announcer Cross, of WJZ, also assisted. A special feature of the regular WRC program will be a daily "children's hour" from six to 6:20 broadcast by Mrs. Edward Albion who is experienced in child entertainment. She will write all her talks and handle them in a little more personal manner than most broadcasters in an effort to effect a closer relationship with her young audience.

On Monday, August 6, WRC staged a Marine Corps night, at which Brig. Gen. Logan Feland, Marine Corps, spoke and the Marine Band played.

Centenarian and Child Prodigy Make Radio Address



(C. Pacific & Atlantic Photos)

Former Senator Cornelius Cole, 100 years of age, and tiny Richard Headrick, violin prodigy and film star, combined forces in one of the most unusual programs yet broadcast from a radio station when they appeared jointly in a patriotic speech at Station KHJ, the Los Angeles "Times." The two extremes of human age thus combined in one made a striking picture, as well as a most unusual address.

Do You Know?

MANY owners of sets just know that they have to twist the dials and turn on the rheostat in order to receive signals. They do not understand why. Do you realize how much more fun it would be if you had a working knowledge of why a certain thing had to be done? A few dollars invested in good text books on the subject would make the art of tuning and working a set all the more interesting because you would then understand what you are doing.

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Station WRC Is On The Air

By J. L. Bernard
Radio Corporation of America

THE new giant broadcasting station WRC, located on the New Riggs Bank Building at 14th street and Park road, Washington, D. C., began a regular broadcasting service on Wednesday evening, August 1. The Radio Corporation of America owns and will operate the new station.

Located in the Mount Pleasant District, one of the highest points in the city, where the antenna wires are suspended 150 feet above the street level, the waves radiating from the station have an unobstructed path in all directions. With the antenna system energized by a powerful 500 watt transmitting set, radio reception from the station in Delaware, Maryland, Virginia, West Virginia, Eastern Pennsylvania and Southern New Jersey should be particularly good, while in the District of Columbia strong signals will be received at all times during the day and evening when the station is on the air. Radio interest in the district and adjoining states should now be markedly stimulated as reception in this section has been unsatisfactory due to "dead spots" in the ether which act as a barrier between the local receiving stations and broadcast stations in New York and elsewhere.

Not only will Washington and vicinity have adequate radio service, but to every corner of the United States, this powerful station may carry the words of great men in political and diplomatic life, the progress of world events as they transpire and the music of other nations as rendered by visiting musicians. This station provides an instantaneous link between the country's political center and every American home and a better understanding of government, of the issues involved in political campaigns, and of the questions which arise in our relations with foreign countries, cannot fail to result from its operation.

There is a wealth of material available in Washington from which to make the programs of WRC most enjoyable and educational. At once it is possible that the ceremonies accompanying the dedications of memorials to great Americans, the features of the many conventions held in that city, and the spiritual counsel of the clergy may be carried to the transmitter and set forth so that the whole country may hear and appreciate them.

Momentous events, of interest to the nation, do not occur every day. The greater part of this station's operating hours will be devoted to the broadcasting of the musical and dramatic talent of Washington and other events of special interest to residents of that city. Washington is rich in both professional and amateur talent and every effort will be made by those in charge of station WRC to arrange programs so that those local interpreters of music and drama may be heard from time to time not only by their fellow-townsmen but by citizens of neighboring cities.

The studio, as well as the transmitting apparatus and office, is located in one section of the building. The studio is of acoustically correct construction and prevents even the minutest echo which might otherwise blur the clearness of transmission necessary to enjoyable entertainment.

This room is a very vital part of the several broadcasting stations of the Radio Corporation of America. Behind several huge panels are vacuum tubes of medium size used to strengthen or amplify the electrical currents which carry voice or music before actually reaching the transmitter. Their use is especially necessary when the program is being brought to the station over a wire a few miles in length, otherwise there would be insufficient energy to materially affect the radio waves. Used in connection with programs taking place in the studio, they are invaluable. The artist may move away from the microphone, may sway closer to it in his earnestness, but by a touch of a knob, the man at the control board can offset these variations.

Close to the operator, and occupying the greater part of the room, are the powerful transmitters. Although but one will be in use at any time, two complete sets are provided that a reserve unit may be in instant readiness should the active set fail for any reason. It is planned to operate these outfits alternately on alternate days. Either set is the equal in power, range and clearness of any now in use, being rated at 500 watts effective output, but if the two sets are combined for the broadcasting of some special event, the range of this station will far surpass that of any other in the country.

Each is complete in itself and contains all necessary tubes, inductions, condensers and transformers, this equipment being mounted behind a large panel and completely shielded by a perforated steel cabinet. This not only eliminates any chance of interaction between the radio-and audio-frequency currents, but protects the operators from accidentally coming in contact with bare surfaces carrying 2000 volts.

The operating table is in front of the transmitters and on it is a small box through which the operators may throw in either of the powerful transmitters and listen to the outgoing program at various stages of its progress. On this table also is a microphone that the operator on duty may cut-in and talk to the "unseen audience" himself should this be necessary at any time. By means of an intercommunicating phone he may talk to office, studio and reception room or be called by them. Because the law requires that a transmitting station must constantly listen-in for distress signals from ships, a highly efficient receiver is provided.

The motor-generators are housed in an adjoining sound-proof room, that their low hum may not disturb either artists or operators. Two machines are provided, one for each transmitter. Each of these powerful units consists of a single motor driving two generators, one of which supplies 2000 volts for the oscillator and modulator tubes and 1000 volts for the amplifier tubes, while the other furnishes the 125 volts used to operate the automatic relays and the 88 volts which heat the filaments of the large vacuum tubes.

A unique feature of this station, and one which further assures perfect transmission of programs, is a device known as the oscillograph, by which the operators have before them "a working picture of the voice." The delicate instrument may be switched into any one of the many circuits and shows, by means of an undulating, ever-varying beam of light, exactly how the artist's voice or music is affecting the electrical and radio currents. By watching this little tell-tale beam, as reflected from revolving mirrors, the observer knows instantly whether the sound waves are too weak, too great in volume or blurred.

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A Workable One-Control Set

By Byrt C. Caldwell

THE tendency in the design of radio sets today seems to be towards simplicity of control and low cost of operation. The set which will ultimately win the stamp of approval from the millions of radio fans, and which will be accepted as the final word in radio receiving sets will be a one-tube set, capable of

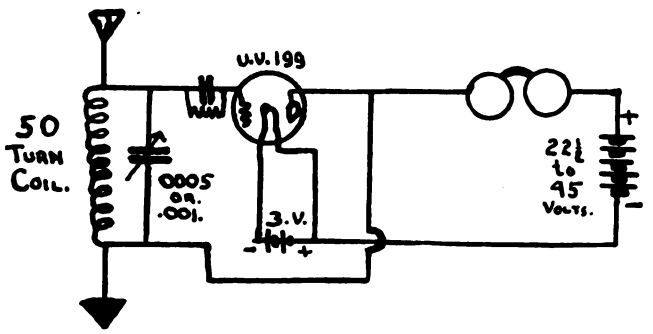

Fig. 1. Circuit diagram for the single control set. Note that the only variable feature of the set is the condenser dial, even the rheostat being done away with.

receiving several thousands of miles, and of using a loud speaker on the local stations—a set which requires no filament battery, only a low voltage B battery, and which has only one control. This set is far from being only a fantastic dream. We are already far on the road towards the realization of such a set as this, and it will not be many years before the seemingly impossible has been accomplished.

With all this in mind, the writer designed a one-tube, one-control receiver which brings in the distant stations, has a low initial cost, and an almost neglible cost of upkeep. The set is a single circuit regenerative, using a honeycomb coil (or spiderweb) for inductance, and a UV199 or C299 tube. This tube is not critical, I have found, as to plate and filament current requirements and therefore no rheostat or potentiometer is necessary. The inductance is of a fixed value and the only control is a .0005 or .001 condenser. This set is far more selective than you would suppose it to be with only one control, and with the new wave length allotments, is all that is to be desired. No interference is encountered.

The panel is size six by eight inches, and is marked out for the instruments as shown in the diagram, Fig. 2. The antenna and ground connections are at the top of the panel, and the inductance coil is directly beneath these. The condenser, which should for best results be of the two-plate mica dielectric type, is mounted under the coil, and the tube is mounted on the base. The grid leak and condenser is fastened directly to the grid post of the tube socket. The coil may be mounted either on the front or on the rear of the panel. The arrangement of the instruments given is best for short straight connections and should not be changed.

For those who wish to make the set with a one-step amplifier, I give the second diagram, Fig. 3. The set still has but one control and is made on the same size panel. The only difference is that the detector tube is moved to the left to make room for the amplifier, and the transformer and a jack is inserted in the center of the panel, so that the detector alone may be used if desired.

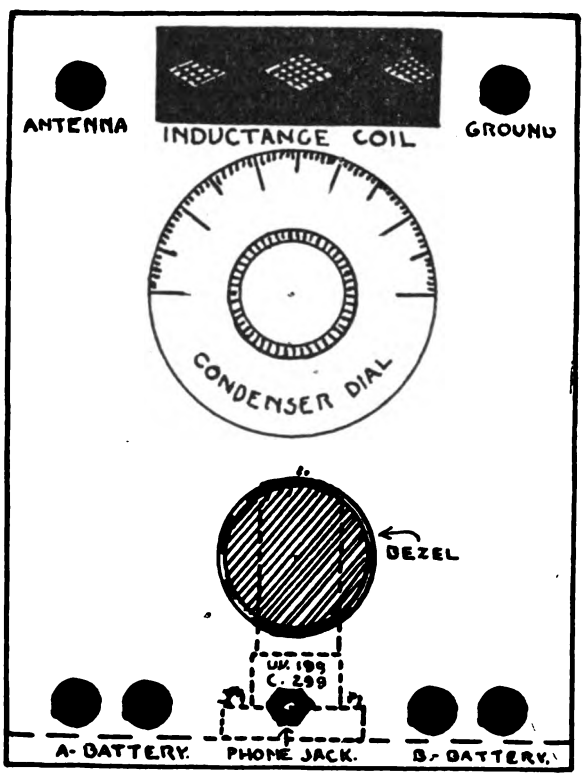

Fig. 2. Panel layout for a set embodying a single detector tube.

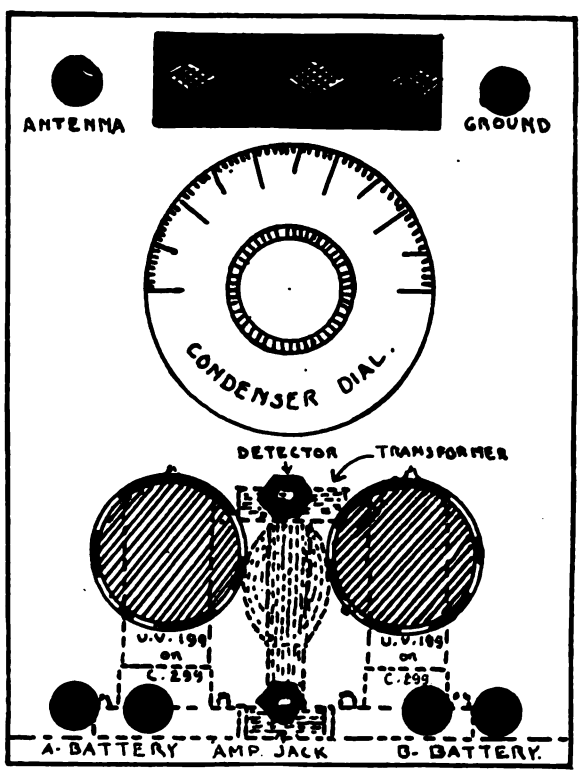

Fig. 3. Panel layout suggested for a detector and one stage set.

No hook-up is given for the amplifier, as any standard hook-up will do.

I would give the same precautions that are usually given. Use heavy wire, make the shortest possible leads between connections, and do not run two wires parallel for any distance.

(*Concluded on next page*)

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Amrad WGI, broadcasting station of the American Radio and Research Corporation at Medford Hillside, Mass., after making some alterations in their transmitter, are again on the air.

* * *

The British Government will probably establish an imperial wireless service in conjunction with the Marconi organization and will have a high-power station erected at Rugby in little more than a year.

* * *

What Ben Bolt can't understand is why Oliver Herford, or anybody else, should want to throw an egg into an electric fan. "Hasn't Edison," he asks, "already yolked the lightning?"—*F. P. A., in New York World.*

* * *

Capt. R. W. McNeely has been designated to relieve Commander S. C. Hooper as chief of radio section, Bureau of Engineering, U. S. Navy. Commander Hooper left to become Fleet Radio Officer under Admiral Coontz on July 14.

* * *

Radio talks on the prevention of forest fires are being broadcast every two weeks from the Portland, Ore., office of the Forest Service, United States Department of Agriculture, through an arrangement with the Portland *Oregonian.* Definite dates have been fixed for these talks, which, according to estimates, reach from 10,000 to 15,000 people.

* * *

Statistics are always interesting and often surprising. As witness the fact that P. C. Kullman & Company, a New York brokerage house specializing in wireless securities, has developed the information that Italian Somaliland (a part of former German East Africa), contains as many wireless telegraph land stations as the whole of Russia. Alaska possesses more wireless stations than France and Algeria. The United States and its possessions operate more land stations (excluding ship and amateur stations) than all the rest of the world.

A carload of toothpicks was shipped to Japan recently by a factory in Strong, Maine, on an order received by radio.

* * *

The Shipping Board vessel "Eastern Glade" reported to the Navy Department at Washington, D. C., last week, it had heard the Annapolis high-powered radio station throughout a recent voyage to South Africa, 6,800 miles away.

* * *

Natural steam, obtained from a 400-foot geyser boring, generated 21 kilowatts of electricity in tests made recently at Santa Rosa, Cal. It is said to have been the first time such a feat has been accomplished in the United States.

* * *

A contract has been signed between the Western Union Telegraph Company and Italian Submarine Cables Company, represented in New York by its president, G. Carosio, for the establishment of direct cable communication between the United States and Italy, via the Azores.

* * *

Captain Herbert Hartley, of the S. S. "Leviathan," announced by radio last week that visitors would be welcome aboard the big ship as she lay at her New York dock. The people with radio sets, about 4,000 of them, accepted with alacrity on sailing day and caused considerable confusion among visitors who came to see friends off on the second voyage of the vessel.

* * *

The engagement is announced of Miss Eleanor Lee Whitman, of Cambridge, Mass., to Mr. Charles Jacob Young, of New York City. Mr. Young, who is pursuing radio research development for the General Electric Company, at Schenectady, N. Y., is the son of Owen D. Young, chairman of the board of directors of the General Electric Company and of the Radio Corporation of America.

* * *

Few radio fans realize that the transmission of code travels much greater distances than is possible when similar waves are modulated by sound vibrations, which explains why the radio telegraph code, rather than phone, is employed by the MacMillan Arctic exploration party to establish communication with civilized countries in the Northern Hemisphere, thus bringing into direct contact individuals who are living in two extremes of temperature. Learn the code and listen in for Operator Mix of WNP!

* * *

No radio in Sing Sing Prison was the verdict last week of James L. Long, deputy superintendent of state prisons. This is the first official statement definitely settling whether the radio presented by the Salvation Army for condemned slayers in the death house would be installed. Several Sing Sing attaches were strongly opposed to the idea. They pointed out that, with cold-blooded murders going on outside, the impression should not be given to the criminal class that life in the death house awaiting execution is enjoyable.

PRESIDENT HARDING

WITH sincere sorrow and genuine regret, RADIO WORLD performs the duty of recording the death at San Francisco on August 2, 1923, of Warren Gamaliel Harding, twenty-ninth President of the United States.

He was a calm, urbane, courageous man with a cheerful, friendly personality that endeared him to all with whom he came in contact.

His handling of the stupendous tasks of the post-war period, enabling the United States quickly to recover from the great struggle to preserve civilization, will go down in history as the work of a remarkable man and statesman.

We have lost a great President.

(*Concluded from preceding page*)

This set is extremly easy to build. It is, however, an ideal set for the more experienced fan, as well as the youngest beginner. Its one-control makes it popular with the housewife who, during the day, wishes to listen to the numerous programs, but does not like to work away at a set of dials for a long time.

The one step of audio amplification makes it possible to use the set on a loud talker. Of course two steps of A.F. amplification may be used if desired, and radio-frequency amplification may also be added. The only changes will be an increase in the size of the panel, and a slightly different arrangement of the instruments.

Try this set. You will be more than satisfied.

Broadcasting Changes

THREE new Class A broadcasting stations were licensed by the Department of Commerce during the past week and five were transferred to Class A from Class C.

New Class A Stations

Call	Station	Meters	Kcys	Watts
WTAD	Compton, Robt. E., Carthage, Ill. (formerly WCAZ)	229	1310	50
WSAX	Chicago Radio Laboratory, Chicago, Ill.	268	1120	20
KFJJ	Carrollton Radio Shop, Carrollton, Mo.	236	1270	50

Transferred C to A

WEAH	Wichita Board of Trade, Wichita, Kan.	244	1230	100
WIAQ	Chronicle Pub. Co., Marion, Ind.	226	1330	10
WMAY	Kingshighway Presby. Church, St. Louis, Mo.	280	1070	10
WOAB	Valley Radio, Grand Forks, N. D.	280	1070	5
KNJ	Roswell Public Service Co., Roswell, N. M.	250	1200	150

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A Universal Wave Length Radio-Frequency Set

By R. L. Dougherty

TO many amateurs radio-frequency presents the only means of getting distance. They are handicapped by being in closely confined cities with tall steel buildings all around them and they know from sad experience that the regulation regenerative sets will not give them the distance they desire.

They have, however, tried radio-frequency amplification and find to their disgust that they cannot do anything with it. It seems that they are handicapped by some force beyond their control.

The probable trouble is that their radio-frequency amplifiers are sadly inefficient. They respond to waves of one length more readily than to any other. What the remedy is they do not know, and they continue to be satisfied with mediocre results until someone finally comes along and shows them a simple and efficient means of accomplishing the desired effect.

The receiver described herewith overcomes all the objections to the common brand of radio-frequency receivers, inasmuch as it will respond to 25,000 meters as efficiently as to 200, and with no extra trouble. You will be able to tune your radio-frequency amplifier to 460 meters along with your detector tube and you may be sure that you are getting all that is possible on that wave.

The apparatus needed for this set consists of: one double honeycomb mounting; one single honeycomb mounting; two tubes; two sockets; two rheostats; one .0005 variable condenser; one .001 variable condenser; one .00025 fixed condenser; one 2 megohm grid leak; one 400 ohm potentiometer.

As can be seen by the bill of materials this is to be a honeycomb coil set, and is therefore applicable to any wave lengths that you wish to listen in on.

The radio-frequency amplifier is what is known as a tuned impedance coil, and it is by this means that the wonderful selectivity is possible with this receiver. It is not only able to respond to any wave length but it can be tuned around with the rest of the receiver and the best tuning accomplished. Other stations on nearby waves will not have a chance.

Special care should be taken not to let the coil in the radio-frequency circuit be within the range of the two primary and secondary coils. If this is done, there will be feedback, and the advantage of fine tuning will be lost. For that reason the coil can be mounted in the back of the cabinet or some other out of the way place where it will not cause interference.

The set is tuned much the same as an ordinary non-regenerative circuit, varying the coupling between the primary and secondary and varying the condenser capacity.

For broadcast work the coil that should be used in the tuned impedance is DL 35 which will have a range of from 360 to 480 meters. For higher waves a 50 or 75 can be used. If commercial is desired a 100 should be used.

As a help to the uninitiated, it is always a good plan to use a size smaller coil in the tuned impedance than is used in the secondary of the coupler.

Assume that the builder has constructed his set, has paid particular attention to the polarity of his batteries and the wiring and now desires to receive signals. Turn up the two tubes, putting the condenser in the primary circuit at about 80° and the condenser across the tuned impedance coil at about 50°. Vary the coupling between the two coils until the desired station is heard, bringing it in loud and clear as possible by means of the condenser and the coupling. Then vary the condenser across the tuned impedance until it is absolutely clear, finally adjusting the potentiometer across the first tube for loudness. This completes the entire adjustment of the receiver and from that time on all the tuning is done, or rather can be done by means of the two condensers.

If the signals do not come in as clear as you would like them try using a larger tuned impedance coil. For the benefit of those who contemplate the construction of this receiver, the following honeycomb coils will allow reception over all the broadcast wave lengths: One 25 DL; two 35 DL; one 50 DL; one 75 DL. These can be purchased for a small amount and the builder will then have a receiver that is capable of bringing in the distance. If longer waves are desired the coils can

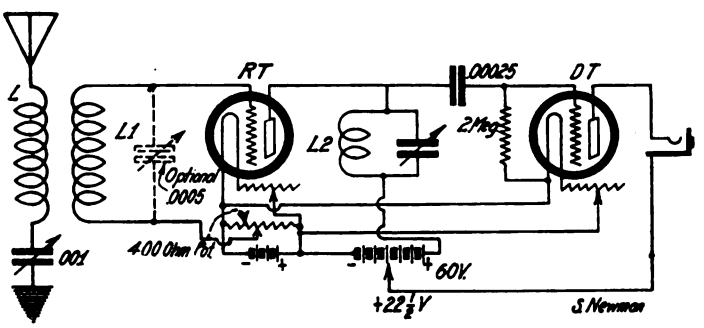

Diagram illustrating a radio-frequency set using honeycomb coils. L, primary honeycomb coil. L1, secondary honeycomb coil. L2, tuned impedance coil used as radio-frequency amplifier. The condenser shunting should be .0005 mfd.

be brought up to 750, which will then allow reception up to 3,500 meters with ease.

One point of caution for the fan who expects wonders of volume from this set. One stage of tuned impedance radio-frequency will allow greater distance than can be gotten on any single tube regenerative, but the volume will be about the same as with the single circuit set. So do not construct it with the idea that your first tube will give you signals equal to a stage of audio. It will not, but the distance over which you can hear with the circuit will be vastly improved. Radio-frequency amplification does not improve the volume of the signals as much as the distance over which they can be received, and as it is distance that is necessary to the success of most circuits, the aforementioned circuit will prove a pleasure to the fans who do not have to fill the room with music. Remarkably clear reception will be noticed, which is so different from noisy regeneration.

Maybe It's Your Grid Leak

MANY sets function poorly because the grid leak resistance is not correct. If you do not happen to own a variable grid leak, keep several fixed ones on hand, and substitute them for each other occasionally to see if you can't obtain better results.

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Here Are Some of the People B

Four of the Many Prominent Artists Whose Talents Are Broadcast Free to the Radio Public by Radio Broadcast Central, New York City.

In the upper left hand picture is shown Frank La Forge, one of the most famous pianists in New York, snapped during a concert from Broadcast Central.

William Van Hoogstraten, the eminent conductor of the New York Philharmonic Orchestra, whose Stadium Concerts have been a feature of WJZ programs for the entire summer season, is pictured at the upper right. (Photo C. Underwood & Underwood.)

L. Wolfe Gilbert, one of America's favorite song writers, is a habitué of WJZ, his programs being most popular with the fans. His picture is at the lower left. (Photo by National, N. Y.)

Miss Margaret Madigan, well known soprano, who has proved a great favorite with WJZ audiences, is shown in a charming pose at the lower right.

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ack of the Broadcasting Scenes

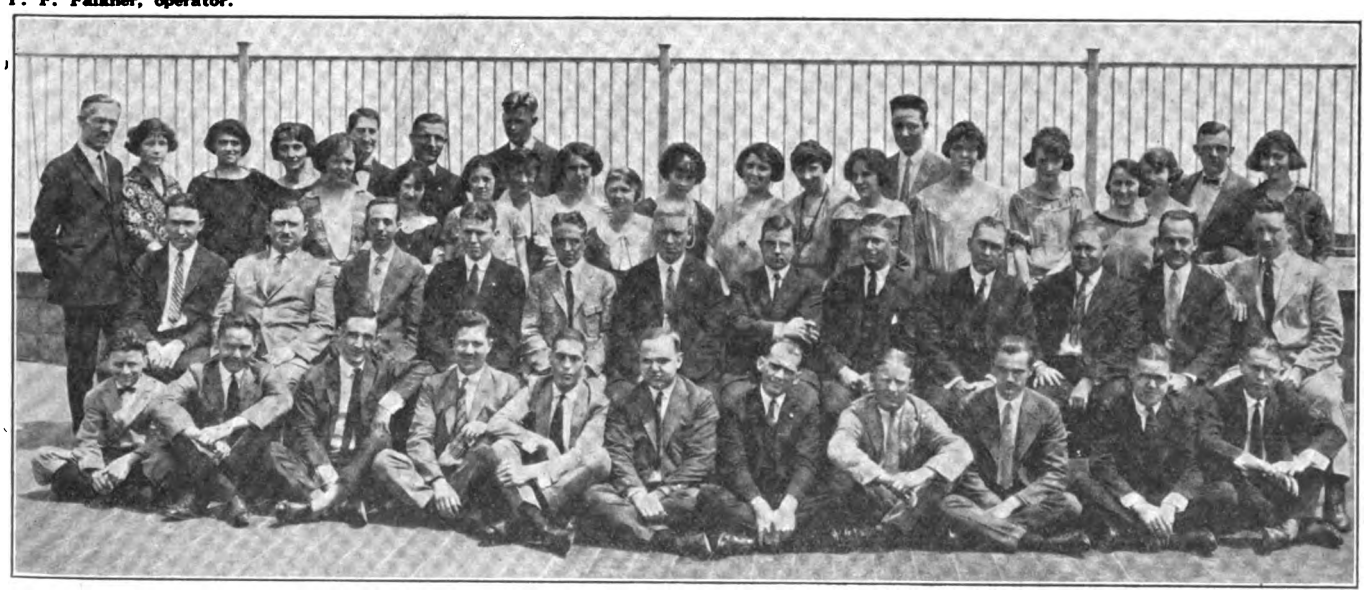
Personnel of Radio Broadcast Central, Stations WJZ and WJY, New York.

Standing, left to right—Carl Dreher, assistant station engineer; Miller, research engineer; E. C. Rundquist, operator; G. W. Rogers, operator; C. B. Popenoe, program manager; J. Weinberger, research engineer; George Oliver, operator; R. B. Lum, announcer OLN; George Ellis, operator.

Seated, left to right—Raymond Guy, operator; Bertha Brainard, assistant to program manager; Walter Heech, engineer in charge; E. E. Freeman, operator.

Seated on floor, left to right—D. F. Stair, operator; T. H. Cowan, announcer ACN.

Absent on duty—Milton J. Cross, announcer AJN; M. Beckerman, operator; Gerald Gray, operator; John Hutton, operator; B. Jackson, operator; P. F. Falkner, operator.



"This Is Station WEAF"—Personnel of the American Telephone & Telegraph Company's Broadcasting Station in New York City.

Left to right, lower row—B. Donnelly, E. R. Raguse, E. F. Grossman, E. J. Content, W. A. Irvin, G. E. Stewart, D. McKey, M. J. Woods, E. H. Felix, G. W. Johnstone, H. F. McKeon.

Second row, seated—R. H. Caldwell, H. Schoenberger, O. B. Hanson, E. R. Taylor, F. S. Spring, office manager; W. E. Harkness, manager of broadcasting; G. F. McClelland, in charge of commercial department; S. L. Ross, director of programs; V. A. Randall, studio director; H. C. Smith, G. Chatfield, G. J. Podeyn.

Third row, standing—A. V. Llufrio, M. Lamphere, N. A. Connor, A. Hunt, A Cheuvreaux, E. E. Sniffin, G. Weightman, A. Piana, H. F. Starrett, E. L. Schneeweiss, J. Land, H. Hann, W. F. Barr, G. Turner, E. Howland, A. F. Castleman, M. Jackson, E. M. Charles, W. Rickert, M. Adler.

Fourth row, standing—(Left) A. Ropps, G. McElrath, A. H. Saxton; (right) J. J. Belougny.

Away on duty—J. G. Truesdell, in charge of plant department; J. L. Reynolds, R. S. Fenimore, A. W. Protzman, M. Lorenzen, G. McNamee, A. I. Healey, W. Sweeney, E. R. Cullen.

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Bureau of Mines Plans Further Radio Experiments in Interests of Life Saving

WASHINGTON, D. C.—In connection with its efforts to keep apace with all safety and rescue developments, the Bureau of Mines of the Department of the Interior is planning to continue its investigations with radio communication underground. The development of radio has been rapid and officials of the bureau feel that any application to mine rescue work must not be neglected.

Mr. J. J. Jakowsky, mechanical engineer, has been designated to undertake certain experiments in radio communication at the bureau's experimental coal mine at Bruceton, Pa. Mr. Jakowsky was attached to the Signal Corps during the war, where he had considerable experience with radio work. The co-operation of the Radio Supervisor at Pittsburgh has been promised by the Department of Commerce in the new radio experiments.

Some months ago preliminary radio experiments in sending and receiving underground at the Bruceton mine were conducted with partial success. In reporting on the matter the Bureau of Mines stated that the experiments consisted in receiving signals from without the mine by means of a receiver located inside the mine, and in sending and receiving messages underground through the strata. It was found that with a receiving instrument set at a point 100 feet underground, signals from KDKA station, East Pittsburgh, Pa., could be heard distinctly at a distance of about 18 miles from the experimental mine. In sending waves underground, a Westinghouse 20-watt B. T. model T. F. transmitter was used in such a manner as to send out continuous waves of 200 to 300 meters length. On account of the limited time no attempt was made to modify the apparatus in such a manner as to produce waves of greater length. It was found that signals could be heard distinctly through fifty feet of coal strata, but that the audibility fell off rapidly as this distance was increased. In all experiments a vertical antenna was found to give the better results. The horizontal antenna gave practically no reception. A loop of a single turn was used with fair results. All these experiments were tried with a wave length of 200 to 300 meters, except the reception from KDKA which was 360 meters. In conclusion the report stated:

"The present preliminary experiments, while unsuccessful in indicating any practical method of using wireless waves for underground communications, nevertheless indicate clearly that electromagnetic waves may be made to travel through solid strata. The 'absorption' or loss of intensity with distance is very great for the short wave lengths used in these experiments. Longer wave lengths are known to suffer less absorption and may possibly be found practically effective under certain conditions."

Transpacifics Renew Radio Contest

LOS ANGELES, CAL.—But one obstacle stands in the way of successful transoceanic traffic by amateur radio telegraph stations—direct two-way communication—and reports from Australia giving results of the Transpacific tests leave but one question in amateur circles, namely over which ocean will this final barrier be removed, the Pacific or the Atlantic? Naturally this will result in a rival contest between East and West coast amateurs of the American Radio Relay League.

Already the committee which handled the Transpacific tests in May, including the Long Beach Club of California, the management of the *Radio Journal* of Los Angeles, working with the Victoria Section of the Wireless Institute of Australia, are lining up West coast hams for another trial in October when two-way talks may be tried with Australia and New Zealand.

Reception of signals from high power amateur transmitters in the United States has aroused so much enthusiasm in the land of the Kangaroo that local hams look forward to a two-way leap in the fall, while rumors from the Radio Society of Great Britain indicate that a similar attempt will be made over the Atlantic Ocean in conjunction with American hams through the American Radio Relay League.

The race is on, with present records on either coast standing about equal, and the amateur who first succeeds in establishing two-way communication over either ocean will win the highest honors to date for the Pacific or Atlantic amateur traffic. The choice appears to be between two members of the A. R. R. L., Irving Vermilya, operator of station 1ZE at New Bedford, Mass., and V. M. Bitz, operator of station 6JD at Los Angeles, Cal.

Both of these amateurs have succeeded in sending a complete message via the ocean wave, one over the Atlantic during the famous "Transatlantics" of last year, the other over the Pacific during the "Transpacifics" just completed. Amateur radio awaits with interest the final outcome of the oceanic radio battle.

New Radio Installation at Annapolis, Md.

WORK of installing new 500 k. w. arc apparatus at Annapolis was begun by the navy recently in an effort to eliminate the local interference consisting of mush and harmonics, complained of recently by eastern commercial and private radio operators. A new building is being erected for radio operations, and here the condenser and inductor of the coupled circuit will be installed. No date of completion has as yet been announced but it is reported that the work is now going forward fairly well. Similar work will be started soon at the naval radio station in Honolulu, T. H. Eventually improvements will also be made in the set at Balboa, C. Z. Recent tests conducted by the radio section of the Bureau of Engineering at San Diego and San Francisco with up-to-date transmitting material have resulted in several improvements which will now be adapted to other important naval transmitting stations.

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Latest Radio Patents

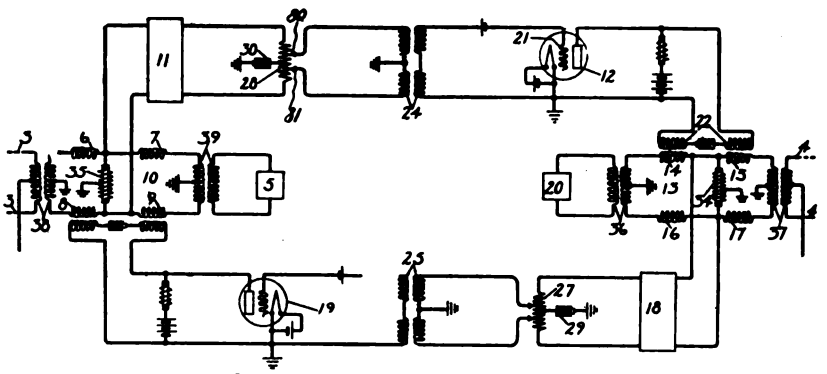
Transmission Circuits

No. 1,456,510: Patented May 29, 1923. Patentee: R. C. Mathes, New York, N. Y.

This invention relates to transmission circuits and more particularly it relates to two-way repeating systems.

As is well known in the art, it is frequently found desirable to provide a repeating or amplifying system between two transmission lines. In one form such a repeating system may have, the transmission lines are terminated in a Wheatstone bridge type of circuit for securing two-way transmission from unidirectional amplifying systems. As is well known, the conjugate condition of such bridge circuits is maintained by providing networks which closely simulate the impedance of the transmission line, or by balancing two similar transmission lines against each other. It is further well known in the art that if a high degree of conjugacy is not obtained there is a critical amount of amplification beyond which one cannot go without setting up a local circulation of energy in the form of a sustained tone, commonly known as singing, It is evident therefore that if any condition exists other than the unbalance between line and net work which causes the transmission of electrical energy between the two circuits designed to be conjugate, such a condition will further limit the amount of gain which can be obtained from the set.

It has been found in practical arrangements of telephone repeater equipment that the capacities between the primary and secondary windings of the transformers employed afford a path for the transmission of energy between the parts of the circuit presumably conjugate. As the transmission of such undesired potentials is through a series capacity, it is most efficient at high frequencies so that it may even result in a sustained singing at an inaudible frequency. This result, while not interfering as direct tone, seriously impairs the normal telephone transmission through the circuit and so necessitates a reduction in amplification.



Circuit used in two-way repeater system utilizing vacuum tubes.

In accordance with this invention, this objectionable loss in transmission efficiency of a two-way repeater circuit may be overcome by shunting these undesired potentials through a low impedance path to ground. One way this may be accomplished is by grounding one or more neutral points.

Wireless Receiving System

No. 1,455,767: Patented May 15, 1923. Patentee: J. Slepian, Swissvale, Pa.

This invention relates to amplifying devices and particularly to wireless receiving systems.

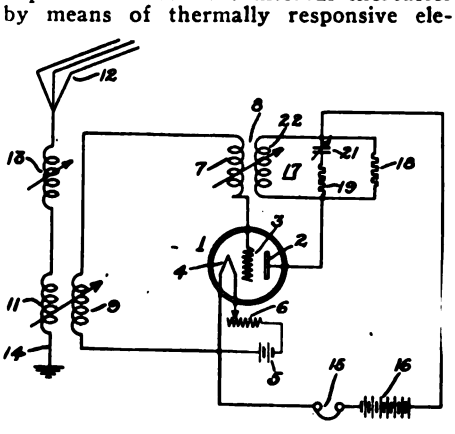
The principal object of the invention is to provide an improved wireless receiving system, wherein received signal impulses are enormously amplified.

Another object of the invention is to provide a wireless receiving system wherein undamped, continuous-wave signal impulses may be readily received without the customary heterodyning step heretofore employed.

Other objects of the invention will be apparent from the following description of the nature, mode of operation and advantages of the invention.

According to the invention, I impress the signal impulses to be detected upon a regenerative feed-back system adjusted to what, heretofore, has been considered an undesirable state, that is to say, one in which an increase in the amplitude of the oscillations causes a more than proportional increase in the feed-back power, tending to maintain the oscillations continuously.

The unbalanced condition of the system, which is effective following the application of the signal impulses, is made stable a predetermined time interval thereafter by means of thermally responsive elements having a time lag in their response. The maximum amplitude attained by the oscillations at the end of said time lag is dependent upon the intensity of the impulses tending to unbalance the system.



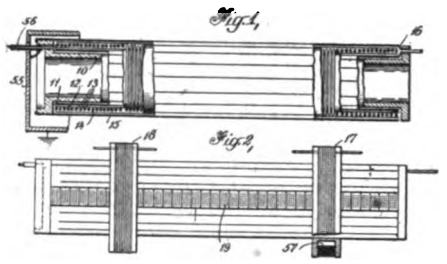
Arrangement whereby enormous self-amplification is possible on one tube.

Wave Conductor

No. 1,456,900: Patented May 29, 1923. Patentee: Michael Idvorsky Pripin, Norfolk, Conn.

This invention relates to apparatus for balancing in phase and amplitude pulsating or alternating electromotive force waves, and has for its object the provision of an apparatus of this character.

The balancing in phase and amplitude of a pulsating or alternating electromotive force wave, and in particular of high frequency waves, has many practical applications, certain of which will be hereinafter described in connection with the wave balance of the present invention. In its broad aspect, the wave balance of the present invention comprises a wave conductor having substantially uniformly distributed inductance, capacity and resistance associated with secondary circuits so arranged that the electromotive forces induced therein, by an alternating or pulsating electromotive force impressed on the conductor, can be relatively varied in amplitude and time phase. The balancing in amplitude and phase may take place directly between the electromotive forces induced in the secondary circuits, or may take place between the electromotive force induced in one of these circuits and an electromotive force modified or influenced by the electromotive force induced in the other circuit. Thus, the invention contemplates the provision of a wave balance having a wave conductor by means of which induced electromotive forces of predetermined amplitude and phase are produced from a given impressed alternating electromotive force, together with means for the utilization of these induced electromotive forces for the purpose of modifying the electromagnetic reactions in electrical circuits, which are subject to the action of the impressed electromotive force.



Apparatus used as a wave balancer.

More Artificial Static

EDITOR RADIO WORLD: I have noted with interest the words of one of your readers, who stated that to chew on celery or a nice, hard apple while receiving a church sermon will result in not being bothered with interference.

I am very fond of popcorn and had been in the habit of making a Sunday evening meal on the fluffy stuff. However, I found that whether listening to a sermon or anything else while chewing on the popcorn, the static was something awful. If anyone who has a receiver is not yet fully aware of the noises he receives in his set that are referred to as static, let him set a pan of juicy popcorn by his side while trying to listen to something he is very anxious to get, and he will have a fairly good imitation of static.

With apologies to no one, I remain

Yours very truly,
R. J. McCUTCHEON.

The Colorado Fuel & Iron Co.,
Pueblo, Colorado.

P. S.—The popcorn being popped is a very good imitation of the kind of static I have been getting for the last couple of nights.

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Answers to Readers of Radio World

I built the White Circuit described in RADIO WORLD *for April 14 and have had good results. I live in an apartment house and have tried using the water and gas pipes as a ground. When I connect it to either of these I get the 110 volt hum. I cannot get an outside ground, yet cannot use either of these. Can you suggest some way of getting around my trouble?—(Unsigned letter.)*

The only manner in which you could stop your trouble is by using a counterpoise, or adapting your set to a loop antenna.

* * *

Is it possible to use audio-frequency amplifying transformers in radio-frequency circuits? Can a potentiometer be used as a rheostat? Can I use a six ohm rheostat as a potentiometer? Will an old-fashioned loosecoupler primary wound with 300 turns of No. 20 DCC wire on a tube seven inches in diameter, secondary wound with 450 turns of No. 26 DCS on a six inch tube and tapped every inch of winding allow me to receive phone music on 360 meters? It is to be used with a Fleming type valve detector.—Guy de Laufellet, Baton Rouge, La.

It is not possible to use audio-frequency transformers in place of radio-frequency transformers. The resistance in potentiometers is extremely high, and if used in place of rheostats they would have so very little of their useful resistance used that it would be negligible, as five or ten turns of the wire would be all that could be used. A rheostat cannot be used as a potentiometer. The coupler you mention is entirely too large for work on the wave lengths you specify. The dead-end loss in couplers of that size is so large that it would cut your volume and range down immensely, especially as you intend using a Fleming valve detector, which we take to mean the two electrode type which is only slightly more sensitive than a crystal detector.

* * *

Which is more sensitive, a galena crystal or a zincite-bornite combination? Is it always necessary to shunt the phones in a crystal circuit with a condenser? Where is the best place to locate a 43 plate condenser in a set consisting of a coupler, crystal detector, fixed condenser, phones and lightning arrester?—Leonard Hirtz, Albany, N. Y.

The galena is slightly more sensitive, but the combination has the advantage of stability which more than overcomes the very slight difference. Of course you understand that in crystal detectors the whole secret of success depends upon the crystal, as it is sometimes necessary to go through pounds and pounds of the raw mineral before finding one suitable sensitive crystal. Most all of the crystals sold are sensitive, but even tested minerals vary greatly. It is not absolutely necessary to shunt the phones, but the added clearness of reception fully warrants it. Suggest that you connect your condenser across the secondary of the coupler.

* * *

In one of the articles written by J. E. Anderson he mentions making neutralizing capacities by winding two lengths of insulated wire together. What length wire should be used when making these?—Charles Kouff, Pittsburgh, Pa.

You will have to find the correct capacity for your particular tube by winding various lengths together, but two pieces 2½ or three inches long should serve the purpose, winding or unwinding them until the correct capacity is found. An easier and much better method of making neutralizing capacities was suggested in RADIO WORLD for June 9, page 9, by the same writer.

* * *

I am located three houses from the local telephone exchange. Every evening at about 9 P. M. they start their generators. I can hear these all over my set, no matter how I tune. My antenna is 60 feet high and 75 feet long, and does not cross any telephone wires that are exposed. Is there any way to alleviate my trouble, other than using filters or tuned choke coils in my antenna circuit, as neither of these work? Would the use of a loop be of any help?—M. Blumenthal, Bronx, N. Y.

Since you mention that filters and choking systems do not have any effect, the only probable solution to your problem lies in the use of a loop. You might, however, before doing that experiment with a counterpoise instead of a ground as it may be that your trouble lies in the fact that your ground and the ground of some part of the telephone system interlink in a manner to cause your trouble. If a counterpoise does not help you out your only solution is a loop receiver. You might inform the telephone engineers of your trouble, and they might be able to help you, and at the same time correct some trouble of their own that they are unaware of.

* * *

Is there any reason for my getting clicks in my set every time the elevator in the building runs up and down? It seems to vary in wave length, being at its highest when the elevator is at the bottom, and gradually going down to about 100 meters when the elevator is at the top floor. How can I remedy this?—Harry Silvertine, 370 Broadway, New York City.

The cause of the noise is the fact that the motor of the elevator is sparking at the commutator, and the cables are acting as an antenna. When the elevator is at the ground floor the cables are longest, and when at the top they are shortest. Remove your antenna from the proximity of the elevator penthouse as far as possible, and also tell the elevator man that he has sparking brushes and to have them corrected. Try using a different ground. You may be getting the clicks due to the fact that the ground you are using is in some manner connected with the iron work of the elevator system.

* * *

I have my set in the car, using a loop antenna for its operation. When running the car I get induction from the spark coils. Can this be due to the fact that I am using the same battery to light my tubes as the one which runs the car? Will grounding one side of the loop as suggested in several technical articles remove my trouble? Would shielding the filament battery be of any use? —J. Namara, Pittsfield, Pa.

The induction you note might be due to the fact that you are using the same A battery for both the car and the tubes. Try using separate batteries. Grounding one side of the loop will not help, and may short your battery if one side of the battery uses the frame of the car as a ground as some cars do. Shielding the battery would be of no use as you are not getting induction from the battery, but the induction coils. Examine the high tension coils carefully and see if they are not sparking unnecessarily. If they are take a small flat file and file the interruptor points smooth and readjust so that they do not spark. You must have some direct connection, otherwise you would be able to tune it out. It is the best practice to use a separate battery in a case of your kind.

* * *

In RADIO WORLD, *June 23 you published a circuit diagram of the three tube De Forest D7 reflex. What ratio are the transformers? Are all three tubes of the hard type? Should the R. F. transformers be of the reflex type? Can W. D. 12 tubes be used? What are the two large black dots at the left hand side of the diagram? What is the capacity of the variable condenser? What is the size of the condenser across the secondary of the last transformer? What wave length does this set tune to using a loop? Using an outside antenna? How does this set compare with a set using detector, two stages of R. F. and two stages of audio? What size panel should I use? Is single control for the filaments better than separate control?—D. J. Smith, Blackfoot, Idaho. Box 427.*

We presume you mean the ratio of the audio-frequency transformers. If you use about 4½ or 5 to one transformers it will be O. K. The three tubes should all be of the amplifier or hard type. It is not necessary that the reflex type transformer be used. You can use the W. D. 12 tubes with this set. The two dots are just a way of showing that the tuning unit can be separate from the set if necessary. They signify connections. The variable condenser should be .001. The fixed condenser should be .002 mfd. Using the proper wave length radio-frequency transformers this set will respond to waves up to 600 meters, whether using antenna and ground with coupler, or loop. It is more efficient than a set using two stages of radio, detector, and two of audio, inasmuch as you are using three stages of radio, crystal detector, and three stages of audio-frequency. We cannot specify what size panel to use, but by careful constructional work and planning, you should be able to accommodate the whole set to a panel about 12 by 12, which is the size of the manufactured set. Single control is advisable as it simplifies the controls, and as all tubes are operated at the same temperature, nothing will be gained by using separate control.

* * *

In regard to the circuit diagram published in RADIO WORLD, *Jan. 20, by Ortherus Gordon, would it be advisable to use DL 75 and 100 in order to meet the new wave lengths? Would two stages of audio-frequency be sufficient to operate a loud speaker? Would W. D. 12 tubes function properly as amplifiers? Where can I obtain a circuit diagram of two stages of audio-frequency to use with this circuit? I have all your numbers.—Don Roy, 1857 E. 19th Street, Cleveland, Ohio.*

You can use these coils for the new wave lengths. You will have sufficient amplification by the use of two stages to operate a loud speaker. The tubes you mention will work satisfactorily. You will find the circuit diagram for two stages of amplification on page 26 of RADIO WORLD, March 31. Take out the grid leak across the first transformer.

* * *

In the July 14th issue of RADIO WORLD *you publish a circuit by A. D. Turnbull. He uses a potentiometer, but I am puzzled as to the connections. Should the two outside connections, or one outside and one inside connection be used?—G. D. Somprey, 1332 S. Peoria Ave., Tulsa, Okla.*

Use one side of the resistance. The other connection is the one that connects to the slider.

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True Piano Music from New Microphone at WGY

TRANSMISSION of true piano quality has been a real problem for the radio engineer. The difficulty is similar to that which has confronted the maker of phonograph records. The blows of the hammers on a piano are distinguishable, but the singing quality and the overtones which are relatively weak have not been reproduced through loud speakers or phones.

P. R. Fortin, of the radio department of the General Electric Company, has devoted a great deal of time to the solution of the problem, and he has now developed a device which will make the piano solo a real feature of a broadcasting program.

The device, in brief, consists of a magnetic system between the poles of which is pivoted a suitable coil system. The magnet is firmly fastened to the frame of the piano and the coil is anchored to the sound board. By means of this pick-up device all tones in the piano are faithfully converted into corresponding electric currents which control the radio transmitter. When heard on the loud speaker the piano is no longer a tinkling sound. The listener gets all the characteristics of this percussion type of instrument, the blow of the hammer, the singing tone and the overtones.

The piano pick-up is free from the familiar hiss of the carbon microphone as well as the objectionable blasting that takes place when an artist plays too loudly for the microphone.

When the carbon or condenser microphone is used to pick up a vocal solo with piano accompaniment the problem is to place the microphone in such a position that it picks up both voice and instrument in their proper ratio. The position of the microphone must be changed for each artist. The radio listener has probably noticed that as the singer increases the volume the accompaniment fades out, in other words the soloist "paralyzes" the microphone. When the piano magneto-microphone is used the intensity of the piano may be adjusted electrically in the control room, even while the selection is being rendered, as the voice is recorded on the customary carbon or condenser microphone.

In the grand piano at WGY there are three of these devices, one in the extreme treble, one in the middle register and one in the base. These three outputs can be readily balanced in the control room for the best results on receiving sets without tampering in any way with the instrument.

Another feature of the magneto-microphone is that it allows WGY to correct for the shortcomings of the present loud speakers. All loud speakers subdue the sounds of lower frequencies, from approximately middle C on the piano down. To give good piano music for users of the loud speaker it would be necessary for the transmitting station to distort the music from the instrument, making the lower section of the piano several times as loud as the treble. Some stations have actually tried to regrade their pianos to improve them for broadcasting. This means that the music, as heard by the musician at the keyboard, is distorted and the good musician, even though convinced that his radio audience is getting perfect tones, cannot do his best work on a regraded piano.

The magneto-microphone may also be used in broadcasting phonograph music where the federal license of the station permits the use of "record" music. When the carbon microphone is used the mechanical energy of the phonograph is converted into sound energy in the usual way and is picked up by the microphone. With the magneto-microphone the needle is attached to the coil and the mechanical energy is converted directly into electrical energy without recourse to any sound whatever, thus giving truer production of the record. By proper design and the use of suitable filters in the electrical circuit of the coil a large amount of the needle scratch may be eliminated.

Put Your Electric Fan on the Floor

THE whole theory of placing electric fans high up in a room to cool it is wrong, is the contention of Julius Wodiska, a veteran manufacturing jeweler of New York. Mr. Wodiska's mechanical bent is attested by the numerous patents he has taken out from time to time outside the field of jewelry. His receipt for a cool room, as given to the New York Times, is this:

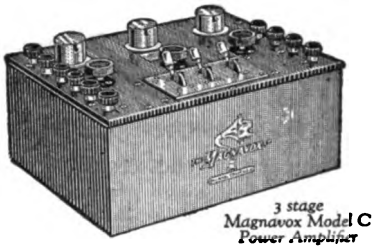
"Open the windows half way from the top and half from the bottom. Then place the fan in a convenient place on the floor. It is commonly known that heated air is much lighter than cold air and that, for that reason, heated air in a room accumulates from the ceiling down. If the upper parts of the windows are closed, the heated air has no way to escape, and the room will be filled with it until it reaches sufficient volume to extend down to the lower, or open, part of the window.

"Under the present system of placing electric fans about two-thirds of the way up the wall, the heated air is driven down and reinhaled by the occupants of the room. Under these conditions the room remains as hot as though there were no fan at all. By opening the windows and placing the fan on the floor, however, the heated air is forced out through the upper part of the window. Fresher and cooler air comes in through the bottom to replace it, and is kept fresh by the whirling fan blades. A room treated in this way will be from five to ten degrees cooler than when the fan is placed where most persons use it. Where there are children, the fan easily can be guarded and accidents avoided."

Naval Radio Efficiency Increasing

NAVAL radio communication efficiency is increasing daily according to Rear Admiral A. H. Robertson, U. S. N., Assistant Chief of Naval Operations. Recently the battleship "Oklahoma," at anchor off Bainbridge Island, Puget Sound, sent an important dispatch for the commander of the battle fleet then at sea off California. The dispatch was relayed three times going down and the answer three times returning; but the reply was received in two hours and twenty minutes. From the "Oklahoma" to Radio Station Puget Sound the message went direct, being relayed to San Francisco from Puget Sound, thence relayed to the battle fleet, consuming one hour and forty-four minutes. Most of the time was consumed in clearing the message from Puget Sound. The return message was faster, requiring only sixteen minutes. The Admiral evidently took twenty minutes to read and answer the dispatch.

MAGNAVOX
Radio Products



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Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

E. Baier, 4554 Park Ave., New York City.
Gerald R. Hough, 188 Lembeck Ave., Jersey City, N. J.
G. Erickson, 1708 Winona Ave., Chicago, Ill.
N. D. Lacey, Bevington, Iowa. (Retail builder.)
J. C. Lamey, 1521 Thirty-first Ave., Gulfport, Miss.
Geo. Kane, 178 Randolph St., North Abington, Mass.
Carleton E. Brewster, Jr., 78 Main St., Bay Shore, Long Island, N. Y.
Maxwell K. Murphy, 2 Orange St., Eastport, Maine.
John Hurley, 94 Parker St., Pittsfield, Mass.
G. B. Gilchrist, 141 Grove Ave., Prescott, Arizona.
Fred Gurgenson, 278 Poplar St., Roslindale, Mass.
William E. Dennis, 6141 Webster St., Philadelphia, Pa.
Roger W. Kingrose, 81 Woodward Road, Providence, R. I. (Distributor).
J. W. Mitchell, Stoughton, Mass. (Retailer. Wants condensers and other radio goods).
E. K. Roth, 301 Atlas Bldg., Tulsa, Oklahoma.
Charles W. Rankin, 2AZO, 221 Union St., Hudson, N. Y. (Interested in both transmitting and receiving parts).
M. H. Schafer, 16 Viola St., Providence, R. I.
Albert J. Kissinger, 123 Loepere St., Buffalo, N. Y. (Builds sets).
La Compagnie Radio-Concert, 20 Ave. Laviolette, Trois-Rivieres, Quebec, Canada. (Retailers).
Harold W. Offins, Dorris, Calif. (Manufacturer and dealer. In the market for panels, knobs, pointers, dials, sockets, metal inserts, moulds, moulded composition, etc.)
Wm. Schwarz, Cochecton, Sullivan Co., N. Y.
P. L. Spencer, 4129 North Eighth Ave., Birmingham, Ala. (Wants dealers' proposition.)
V. C. Wilson, Gilmor Pharmacy, Newcastle, Neb. (Dealer.)
Philip T. Downes, 197 West 134th St., New York City.
L. E. McConkey, Box 7, Mehan, Okla.
Davis Chipps, 815 Jackson St., Corinth, Miss.
R. R. Giles, 2414 Danforth Ave., Toronto, Ontario, Canada.
Charles W. Cartwright, Jr., 31 Dunlap St., Dorchester, Mass. (Radio equipment, repairs, supplies.)
Clement E. Anderson, Unionville, Mo. (Will start a small radio retail business.)
A. B. Niess, 1307 Spring Road, N. W., Washington, D. C. (Will build several sets. Wants contract with retailer of copper ribbon for loops.)
Earl R. Stright, 812 South Peag St., Dallas, Texas.
Mobile Optical Co., Mobile, Ala. (Want jobbers' prices on parts, wire and complete sets.)
F. G. Lacey, 139 East 36th St., Indianapolis, Ind. (Interested in best goods only.)
A. S. Waterbury, Perry, N. Y. (Retailer—wants to hear from manufacturers and jobbers.)
B. R. Stiles, Box 296, Moville, Iowa.
William Clyburn, 67 East Boulevard Drive, Atlanta, Ga. (Wants agency for radio products.)
Lewis Rogers, Genesee Apartments, Lockport, N. Y.
J. E. Pratt, 512 Marie Avenue, Avalon, Pa.
George J. Boehm, 25 Russell Street, Brooklyn, N. Y. (Retailer and builder of sets.)
George J. Reinhart, 55 Kirkpatrick Street, Buffalo, N. Y.
E. E. Sweet, 920 East 19th Street, Minneapolis, Minn. (Wants wholesale prices.)
Bennie Rudner, 64 Hand Street, Rochester, N. Y.
E. E. Schwartz, 1103 Twenty-fourth Street, Des Moines, Iowa.
L. H. Haselton, 33 Elm Street, Keene, N. H.
Edward G. Beverstock, Minsonville, N. H.
Edward MacFaul, 1633 Linwood Avenue, Niagara Falls, N. Y.
The Claritone Co., 425 Temple Court Building, Minneapolis, Minn.
B. B. Wilcox, P. O. Box 189, Duluth, Minn.

Wants to Sell Radio Parts

EDITOR, RADIO WORLD: For the past year I have been selling radio parts during spare time. I would like to hear from manufacturers and jobbers having good propositions to offer.

Yours truly,
ARNOLD BLAESE.
Franklin Hotel, Valparaiso, Ind.

Radio Trade Notes

Poster & Co., of 552 Seventh Avenue, New York City, well known in the panel business, announce that they are moving to larger quarters at 61 Duane Street.

* * *

E. B. Mallory, Manager Radio Sales, Westinghouse Electric & Mfg. Co., was elected chairman, Radio Section of the Associated Manufacturers of Electrical Supplies, at the annual convention held at New London, Conn. Mr. Mallory, accompanied by Meade Brunet, District Manager, Radio Corporation of America, is leaving at once on an extensive tour of the Middle West to make a thorough study of the market conditions in that territory.

* * *

Minnesota Radio Co., 20 West Lake Street, Minneapolis, Minn., jobbers, want prices on a long list of radio supplies.

The Spielman Electric Co., Inc., has removed to new and larger quarters at 311 West 59th Street, New York City.

* * *

Cape Cod Radio Supply Co., Wood's Hole, Mass., is reported to be in the market for an extensive list of radio supplies and parts.

* * *

Standard Electrical Supplies Co., 11 Moore Street, New York City, want agencies for various radio parts.

* * *

G. H. Fischer & Co., 317 Cypress Hills Road, Glendale, Long Island, N. Y., is in the market for small aluminum castings.

* * *

S. A. Twitchell, 1925 Western Avenue, Minneapolis, Minn., wants a machine for winding honeycomb coils; also is in the market for radio parts and name plates.

* * *

Robin Radio Shop, 3602 Fifth Avenue, Pittsburgh, Pa., wants quotations on electrical measuring instruments and various radio parts. Interested in a machine for engraving panels.

* * *

American Druggists Syndicate, Long Island City, N. Y., is in the market for aerial wire in large quantities.

Campaign Begun Against Fake Radio Apparatus Makers

THE initial move in a far-reaching campaign against the practice of selling fake radio apparatus was made last week, when Judge Boettner in the First Criminal Court at Newark, N. J., held Robert and Elmer Levy of the Randel Wireless Company, 9 Central Avenue, that city, in $2,000 bail each for the Grand Jury on a charge of selling wireless headphones bearing the name and other trade designations of C. Brandes, Inc., of New York City, for many years manufacturers of radio headphones.

During the course of the hearing testimony was introduced bearing upon the purchase in the Randel store of a pair of fake Brandes superior receivers, which were introduced as evidence and identified by Everett D. Holley as having been manufactured by the latter in his factory in Newark.

Mr. Holley testified that some time in March he received a visit from Robert Levy and a second man, whom Levy introduced as Mortimer Salzman. Holley testified that Salzman was represented in the introduction as a Brandes distributor. Holley related that he was asked to make up 2,000 headsets with the Brandes Superior stamp on them, the understanding being that the order was to be increased to 50,000. Delivery of 1,400 of these headsets was made to persons who identified themselves to Holley by presenting one-half of the card of the Randel Wireless Company, which previously had been torn in half, one part being retained by Holley and the other taken away by Levy.

Expert testimony as to the differences between the genuine and spurious phones was offered by Cecil E. Brigham, chief engineer of C. Brandes, Inc., who said that the diameter of the sound holes in the caps of the spurious phones was larger than those in the original. The screws holding the mechanism in the cups are much larger and not nearly so close to the surface as in the genuine, the cords are of cheaper construction and are weak and uncovered at the studs in the spurious phone, whereas in the genuine the construction is much stronger and durable. Mr. Brigham also pointed out differences in the stamping on the case, the words "Pat. pending" and "Made in U. S. A." being of larger type in the spurious than in the genuine.

Salzman, who waived examination at the hearing, was held in $500 bail and Holley is also held in $500 bail in connection with the fraud.

Arrests in the case were made following an investigation which began with tracing a thin strip of cloth binding used in the construction of the cartons containing the spurious phones. These cartons were also closely counterfeited, practically the only difference being the style of the type used.

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Theatrical Managers Now Becoming Interested in Radio As Broadcasters

THE announcement made by Marcus Loew last week to the effect that he had arranged with George Shubel to transfer the WHN station from Ridgewood, L. I., N. Y., to Loew's State Theatre Building on Times Square, New York City, was a surprise to those who have not known of Mr. Loew's interest in radio.

Theatrical managers and producers have been holding aloof from radio, and in several instances have declared their antagonism to the entertainment furnished by broadcasting. Mr. Loew's announcement, therefore, that he is to furnish many of the headliners and the State Theatre orchestra as a part of the WHN programs is all the more interesting. Mr. Loew promises also to furnish other celebrities of the stage and screen for short talks at WHN. This manager, by the way, is one of the principal stockholders in the Metro Pictures Corporation, which controls the services of several eminent screen stars.

It will be interesting to note what other managers will do in the field of broadcasting now that Mr. Loew has thrown his hat into the ring. At least one owner of several legitimate theatres has declared that he is going to establish one of the biggest broadcasting stations in this country.

RADIO WORLD may have something interesting to say in an early issue regarding a new booking office, through which talent for broadcasting is to be booked in the same manner as the business is conducted by the big theatrical booking agencies.

Kansas City's Mayor Strong for Broadcasting

EDITOR, RADIO WORLD: I will answer your letter of July 23 by saying that if all the chief executives of our American cities should have an experience similar to mine in broadcasting civic news through the medium of civic night programs, and if results as brilliant should accrue to their credit, I know they would all "pull for" and would attain a municipally owned broadcasting station in short order (providing, of course, that their funds would permit).

Yours sincerely,
FRANK H. CROMWELL,
Kansas City, Mo. Mayor.

Broadcasting Interesting to Camden's Mayor

EDITOR, RADIO WORLD: Your letter of July 24th instant received, and the proposition of a municipally owned and operated radio broadcasting station is indeed interesting.

Of course, radio broadcasting is in its infancy, but no doubt greater things than we can picture will be developed from it.

Very truly yours,
VICTOR KING,
Camden, N. J. Mayor.

Vessel Propulsion by Radio Is Forecast

THE next step in motive power for engines on transatlantic liners will be electrical propulsion by power received by wireless from power stations ashore."

This was the belief of Giuseppe Fatterini, Chief Engineer of the Vacuum Oil Company in Italy, who sailed last week on the steamship *Colombo* for Genoa.

Electrical propulsion from shore stations will come to pass within fifty years, was the belief of Mr. Fatterini, as expressed to the New York *World*.

"Recent experiments in Germany and France of driving an airplane by electrical energy furnished from the ground," said Mr. Fatterini, "paves the way for experiments for driving steamships across the ocean by power from shore stations. Another big thing is the extraction of vast power from water by atomic combustion. In a quart of water there is enough atomic power, if extracted, to give out the energy of 300 tons of coal."

Of Interest to Dry Cell Tube Users

THE Radio Equipment Company, 630 Washington Street, Boston, Mass., have put an article on the market that will prove a blessing to the users of WD-11 and WD-12 tubes. It is a very small fuse that fits over the leg of the tube and protects it from high currents passing due to a short circuit. It is very neatly constructed of brass, so made that when it is applied to the filament terminals of the tube the current must go through the fusible material before going to the filament. An article such as this should meet with approval by the users of small tubes, inasmuch as it is said to be the first one in its field. We have had protectors for our six-volt tubes, but have neglected our 1½-volt tubes, with the result that many fans have suffered from blow outs.

No Capacity Effects

THE Thresher Radio & Machine Corporation, 476 Eighteenth Avenue, Newark, N. J., have perfected a telephone jack which has several novel and important features. It differs from all other types as its contact leaves are placed in a vertical position instead of horizontal. Due to the fact that its leaves are so placed in parallel position, those of opposite polarity are edge to edge, instead of parallel, presenting a very small surface to each other, lessening capacity effect. It also takes up very little space, and ample room is allowed for the lugs, giving plenty of connector space. The insulating material used is turned hard rubber. It is made in all the popular styles, from open circuit to double circuit closed.

New Radio and Electric Firms

Grimes Radio Engineering Co., New York City, make radio apparatus, $25,000; R. L. Bradford, C. A. Curtis, P. M. Payne. (Attorneys, Geller, Rolston & Blanc, 22 Exchange Place).

New York Institute of Electric Therapy, New York City, $10,000; S. Ginsberg, M. Finestone, S. L. Lippner. (Attorney, E. Law, 36 West 44th Street).

Rathbun Mfg. Co., Jamestown, N. Y., radio sets, $30,000; F. and C. R. and J. C. Rathbun. (Attorney, J. H. Prother, Jamestown.)

Finestar Electrical Supply Co., New York City, $6,000; L. and G. Feine, S. Starr. (Attorney, B. M. Turkat, 44 Court Street, Brooklyn, N. Y.)

Daily Newspapers Publishing Radio News and Programs

AS a part of its service to readers RADIO WORLD publishes herewith the names of daily newspapers which carry radio programs and radio news. Wherever possible the name of the radio editor of the paper is given. Additions to the list will be published as received.

Brooklyn Daily Times, Brooklyn, N. Y., carries complete radio programs. W. M. Oestreicher, managing editor.

The Christian Science Monitor, Boston, Mass., prints daily in its local edition condensed radio programs from the more important cities in the East. The radio department is in charge of the city editor.

Winsted Evening Citizen, Winsted, Conn. One of the first newspapers to print radio news and programs. Arthur L. Chapman, radio correspondent.

The Attleboro Sun, Attleboro, Mass., publishes a radio program summary and news daily with special features several times a week. C. S. Sherman, radio editor.

A Correction

ON page 20 of RADIO WORLD for August 4 there was printed a diagram of a honeycomb circuit with one stage of amplification. The manner in which the B battery of the amplifier is hooked up is incorrect. The connection running from the plus of the lower B battery which supplies the detector should run directly to the upper post of the jack, and there should be no connecting link between the plus of the amplifier battery and the plus of the detector. The connection should run directly to the upper side of the jack.

Helps to Get That Distant Station

THE Amplex Instrument Laboratories, 57 Dey Street, New York City, have recently put on the market an article called a "grid-denser." It is a very small variable condenser that is to be used in the grid circuit in place of the conventional grid condenser. Variance is made by means of a small knob. It is very neatly constructed, taking up very little space. The range is from .00015 to .0005, which is wide enough to use with all tubes on the market at the present time.

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Radio and Artificial Lightning

ARTIFICIAL lightning, when it is wanted and where it is wanted, is one of the growing wants of the engineer engaged in high power radio work.

The radio engineer at the giant trans-oceanic station uses tremendous voltages for testing purposes, which at times exceed a quarter of a million volts, with the same freedom from concern as the radio fan who connects a six volt battery to his receiving set.

But the use of such unusually high potentials which, when in action, resemble a mimic electrical storm, have an important place in the laboratory and field apparatus of the modern engineering staff the chief use for which is the testing of the insulation material at the high power stations of the Radio Corporation of America. These stations are engaged day in and day out in exchanging over twenty-five percent of the message traffic between New York and four countries in Europe. In fair weather and in foul, subjected to high wind pressure, sleet and snow, the aerial insulators which hang from towers ranging in height from 350 feet to 750 feet must carry the strain of voltage which is impressed upon them with the least possible chance of mechanical or electrical failure. How shall we know whether the insulators in the antenna will safely carry their burden without electrical breakdown? They are essential to uninterrupted communications as the wheels of a locomotive are to continuous transportation. Insignificant as they may seem, elevated to great heights where they appear as mere black specks against the sky, these insulators must be thoroughly tested before installation. They must be tested under the most severe conditions that actual service might impose upon them.

The function of artificial lightning is to imitate these service conditions in the field or laboratory so as to enable an accurate observation of the electrical behavior of the insulator to be made.

It might be asked, "Cannot approximate calculations be made to show without the use of the high voltage and apparent attending hazards just how efficient an insulator is?" This must be answered in the negative. Defects of various kinds evade an attempt by the engineer to apply his mathematical reasoning with certainty.

The generator used to produce the high voltage for testing insulators has a power of 200,000 watts or over 200 horse-power. It is connected through a circuit which increases its voltage to about 150,000. The test insulator has its metal connecting ends joined to the generating circuit and the power is turned on. One of two things can happen to the insulator; it will either allow current to pass through it in which case it will explode into bits or will force the surrounding air to break down under the influence of the high potentials in which case its insulating properties are good and is acceptable for use in the aerial.

During these tests, artificial rain is produced which moistens the insulator in the same manner as an actual rain storm. If the insulator survives the wet and dry test it is fit for service and takes its place in the aerial when needed.

On one occasion at the RCA station at New Brunswick, N. J., the generator was driving an abnormal charge into the antenna when a rain storm came up and drenched the aerial insulators. This was at a time when, during the war, radio stations are most carefully guarded against damage by wartime fanatics. Late in the evening an insulator broke down under the heavy strain and crashed into bits which flew in all directions. The report accompanying the destroying of the insulator caused the military guard a great deal of confusion as they suspected a bomb had been thrown into the radio station.

Radio Replaces Flowers and Fruit at Hospital

IN the old days, when you went to see a hospital patient, you brought him food in the old-fashioned notion that hospitals neglected the culinary niceties, and it was your duty to smuggle in something that the sick person would enjoy. You knew he would, because you were bringing him his favorite dish, and you never could understand that smarty nurse's edict that he couldn't have it now.

Or you went to the florist and tried to choose between roses tied with a ribbon and carnations gracefully arranged in a basket. And you were always amazed to find that some one else had thought of the same thing, only with more success.

Now, all you have to do to be a little different is to get there first with a radio outfit, and that will soon cease to be a mark of particular attention to your sick friend unless you haul up the latest in tube sets which will "get" the Fiji Islands or wherever it is that, the most remote station happens to be.

"Sometimes we have as many as 20 sets in the hospital at once," said Miss Louise Arnold, superintendent of Ellis Hospital, in Schenectady, N. Y. "The General Electric people who have friends here bring in apparatus as soon as the patient is able to enjoy radio. Many are of the crystal type that will catch WGY only. However, as the sick are rarely here long enough to need the greater diversion that might come from being able to listen in throughout the country, they are a great help in passing time. As soon as convalescence begins, radio can be enjoyed."

Some hospitals use it in treating their patients. New York institutions report success in rheumatism and other chronic afflictions where the ether waves are made to act as a sedative. Doctors there say it has cut down the administration of drugs, because in listening to music by radio, the sufferer is made to forget his condition. Others who are in great pain find the programs an ally in stifling the complaints that are forced when the mind has nothing but pain to dwell upon.

Ellis Hospital has seen it so far merely as a diversion, one that is an unquestioned bulwark to the morale of the patient who has long hours alone. Under daylight saving, the programs begin only a little while before visitors must leave, and they continue long enough to top off a day as pleasantly as it is ended at home.

The hospital owns a portable tube set which is taken to the bedside of any patient who expresses a desire to have it and it is in use nightly.

"I read the other day about a hospital in Philadelphia where there is an arrangement whereby radio can be turned on or off anywhere in the place at will," Miss Arnold said. "The whole building is equipped, and any patient who wishes to hear the programs, is able to, while those who tire of it need not be annoyed. Maybe some day we'll have one like that."

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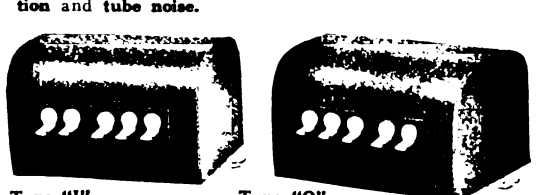

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Popularity of the Radio Drama Proven

IN concluding a season's run of forty-three performances the WGY Players stepped from their parts during the production of "It Pays to Advertise," and addressed their radio listeners. Figuratively, they "stepped before the curtain" and told of the pleasure and interest they had found in this new development of the drama.

If any doubt of the popularity of the radio drama had lingered after this long run by the WGY Players at the Schenectady station of the General Electric Company, it was brushed aside by the hundreds of letters which have literally poured into the station since the announcement that the players would not be heard during the summer months. The outstanding sentiment of the letters was that the listener feels that each of the players is a personal friend. Practically the same cast has been maintained during the long run and these same voices coming into a home week after week have won recognition for the players and a place in the hearts of the listeners. Each radio fan, sitting at his set, feels that a production is something put on just for him and the curtain speeches of the actors helped to cement that feeling of friendliness which exists between performer and listener, no matter how many miles might stretch between them.

A York, Pa., correspondent remonstrates at the discontinuance of the drama as follows: "I would like to know why they (the Players) quit now. In a theatre, of course, it is too hot at this time of the year, but not where I go—my radio set. I take a seat way up front and nobody interrupts me changing seats, no women's hats get in the way, no music or candy hawkers interfere with my enjoyment; there are no long intermissions and you don't even have to dress."

"It seemed like parting with intimate friends and we shall miss you," wrote a radio fan living at East Greenbush, N. Y. "We are glad it will not be long and we shall be anxiously waiting to hear your pleasant voices again in the fall."

Since the initial performance of the WGY Players, "The Wolf," the organization has remained practically the same. Six players who have appeared during the entire season have been: Viola Karwowska, Ida Myrick, Ruth Schilling, Edward E. Schilling, Frank Oliver and Edward H. Smith, director.

The players who addressed the radio audience and who have been with the organization since the first play, "The Wolf," were: Viola Karwowska, Ida Myrick, Ruth Schilling, Edward E. St. Louis, Frank Oliver and Edward H. Smith, director.

These pioneers in the radio drama suffered at first, felt handicapped in their efforts to find inspiration from a microphone in a quiet studio. The audience was unseen and it is rather difficult to find inspiration in something silent and unseen. Then the letters began to come in and these letters established contact between performer and listener. The actor began to feel that he was addressing old friends who were tolerant of weaknesses in a production and enthusiastic when a situation in a plot was put over successfully.

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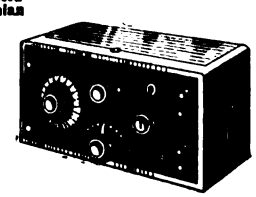

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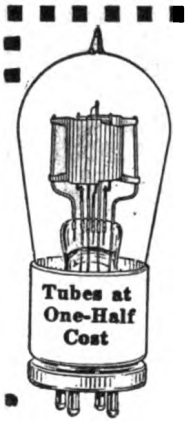

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Chicago Radio Convention Will Be Well Attended

CHICAGO, ILL. — Approximately 1,500 persons, representing all lines of radio activity, ranging from amateurs and experimenters to technical men connected with the radio industry, as well as authorities of international reputation, will attend the Second National American Radio Relay League Convention, which is to be held in this city September 12-15 under the auspices of the Chicago Radio Traffic Association, it is estimated by committeemen.

Tentative plans for the convention, which have just been made public by R. H. G. Mathews, of the Chicago Radio Laboratory, 332 South Michigan Avenue (Chicago), central division manager of the American Radio Relay League, call for a program of interest to both the amateur and the broadcast listener. A huge banquet is scheduled for Wednesday evening.

An intensive effort is being made by Mr. Mathews and officers of the A. R. R. L. at Hartford, Conn., to select speakers who will cover all phases of radio transmission and reception, bringing before those attending the convention all of the most recent developments which may be utilized for long-distance work in the early fall.

One of the most important meetings at the convention, on the afternoon of Thursday, will be that of the A. R. R. L. Traffic Department under the chairmanship of F. H. Schnell, traffic manager of the League, when coming international amateur long-distance tests and kindred matters will be discussed at length.

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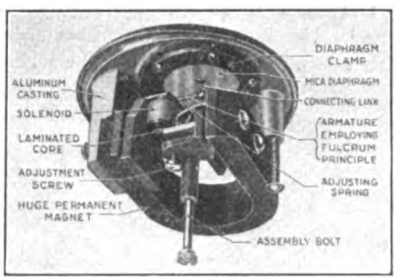

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WHERE, in the world of today and of the next fifty years, during which the contests of commercial supremacy will be fought strenuously, and, in a large sense, permanently, lie the foreign trade Eldorados of the United States?

"In Latin-America and, necessarily, by reach and by riches, mainly in South America," declares A. Guyot Cameron in Forbes Magazine, who makes an earnest plea to business men to wake up and follow example of European countries in the development of these fertile fields.

"The object lesson lies in the example of Europe. In spite of large economic prostrations, of financial constrictions paralyzing effort and almost hope, of restricted creation and distribution of products, Europe is intensively pushing its commercial relations and sowing seeds that will flower into abundant economic harvests from the fields of the future.

"Great Britain in the Argentine and in Chile; Italy in Chile and the Argentine; Spain in Brazil and Argentina, and in every South American nation of Spanish tradition; France in Bolivia; Germany in Brazil, Argentina, and Colombia; Belgium and Holland in many places are making the moves on the checker-board of export effort. At that great game, not of grab nor of gold, but of commercial generalship upon which in large measure depends international power, if the United States does not 'sit in' now, it will find places occupied. And the rules of the game will allow neither over-throwing of the board to start a new play nor displacing of the players already there.

"For it is export that gives the final profit on the total volume of industry and of commerce. Estimates of the percentage vary, but the fact remains, and has been stated again and again by captains of industry and by economic experts that export is the real key to the profits of production, taken generally."

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEER, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

AMERICAN RADIO RELAY LEAGUE, second national convention, Chicago, Ill., September 12-15, 1923. Chicago Radio Traffic Association, 959 The Rookery, Chicago, Ill.

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Frequency versus Wave Lengths

By C. W. Horn

Superintendent of Radio Operations Westinghouse Electric and Manufacturing Company

AUTHORITIES on matters pertaining to radio are agreed that the most logical and useful way of specifying the wave length of a radio station or transmitter is in cycles or kilocycles. This will be evident from careful study of a theory underlying the method of computing either the frequency or wave length.

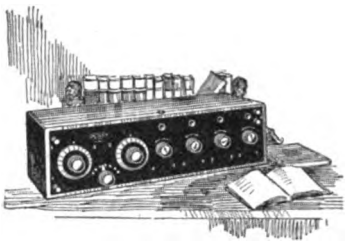
A radio wave travels with the speed of light, which we know to be approximately 30,000,000 meters per second. If the wave length of a transmitter were one meter this would mean that there would be 300,000,000 vibrations or oscillations per second, or, in other words, that the frequency would be 300,000,000. If the wave length, however, were 300,000,000 meters then it would take one second for one oscillation to take place, which would be a frequency of one for that wave length.

From the above it will be seen that by dividing the speed of electricity by the number of oscillations per second, or the frequency as it is usually called, we obtain the wave length in meters. This is the distance between two successive oscillations. If there is but one oscillation per second then the wave length would be the distance traveled in one second, which would be 300,000,000 meters. However, if there should be a million cycles per second then the distance traveled by the wave in one second divided by the number of cycles in that second would give you the wave length of one complete cycle. In other words, more simply expressed, the greater the number of oscillations in a given space of time then the shorter they must be in order to get that many in.

The greatest advantage, however, of expressing the length of the wave in frequencies is that radio formulae always call for the frequency and much time is saved. Also, if you know that your receiver will tune to within 20,000 cycles of another wave it is much simpler to note that the figure is 20,000 cycles than that it is perhaps two meters on the lower wave lengths and perhaps 200 meters on the higher wave length. For this reason it is advisable for everyone connected with radio to accustom themselves to thinking of wave lengths in frequencies rather than in meters.

National Toy Show

THE National Toy Show, which since 1916 has been held annually at the Hotel Imperial, New York City, will be held in the future at the Bush Terminal Sales Building, 132 West Forty-second Street, New York City, according to electrical toy manufacturers who during the last four years have made the largest exhibits at these shows.



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3 Lengths of Spaghetti
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1 Grid Leak and Condenser
1 Bezel
1 Diagram Free

ONLY $8.50

Ask for free price list on all standard Radio merchandise. Orders promptly attended to.

GLOBE RADIO SHOP
115-117 West 23rd Street New York, N. Y.

Greenwich Radio
185 GREENWICH STREET NEW YORK, N. Y.

Moulded Variometers and Couplers... $2.29
Guaranteed 600 M.

Crown Transformers,
Adapted for
ALL TUBES, $2.95
Ratio 5 to 1

U. S. L. VERNIER BAKELITE ENDS CONDENSERS
17 PLATE $2.95
23 PLATE $3.25
43 PLATE $3.45

SEND MONEY ORDER, INCLUDING POSTAGE—PROMPT AND CAREFUL ATTENTION

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c, per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office ten days before publication. RADIO WORLD CO., 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

AUTOMATIC LONG RANGE HEADPHONES, 3200 ohms, $5.00; Brach suspension type weather-proof lightning arresters, $1.50; efficiency variometers, $2.00; Carter two-way plugs, handles two headsets, $0.50; Home-chargers, $10.00; FF Battery Boosters, $14.00; Carter 43 plate variable condensers, $1.50; Carter 23 plate variable condensers, $1.00; code practice sets consisting of standard key and Century Buzzer, $1.10; Federal dials, 4-inch, ¼ and 3/16 shaft, $0.75; Radion hard rubber dials, 4-inch for quarter inch shaft, $0.50; plans and detailed drawings for construction of regenerative receiver, $0.15. Powell May, Box 241, Knoxville, Tenn.

WANTED—Letters from 69th C. A. C. Radio Operators. Vic. Wilson, New Castle, Neb.

"BARNEY GOOGLE," THE FAMOUS SONG, mailed, postpaid, for 25 cents per copy. Get the song that is sweeping the country. The Columbia Print, 1493 Broadway, N. Y. City.

RADIO "TROUBLE FINDING" CHART. It locates immediately the trouble in your radio set! Sent Postpaid 25 cents. The Radio Service Shop, 496 Provident Ave., Winnetka, Ill.

BROADCASTING POST CARDS—Receiving Station Cards and Sending Station Reply Cards, per dozen, 15c. Peanut Set, everything complete, $30. Cabinet Crystal Sets, $3 to $5. Stamp for catalog. PACIFIC SCREW CO., Dept. R, 645 N. E. 53rd St., Portland, Ore.

RADIO DEALERS ! ! !

Have you seen the list of Camps and Camp Directors which started in the MAY 12 issue of RADIO WORLD? Here is a list of all the Camps and Directors of camps in the United States, and is of essential value to any Radio Merchant who is anxious to enlarge his summer business. Get these people interested in installing radio sets in their camps for the benefit of the campers. Any single copy, 15c; or the four issues for 60c. RADIO WORLD, 1493 Broadway, New York City.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Calif.

VARIABLE CONDENSER—Postpaid, one dollar. Radio Apparatus House, 140 Maiden Lane, New York City.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

GUARANTEED BAMBOO FOUNTAIN PEN Non-corrosive pen point. Will not scratch or leak. Writes carbon copies. Price $1.00. Stamps not accepted. Atlas Novelties, Box 355, Beverly, Mass.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

OLD MONEY WANTED—$2.00 to $800.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables. Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. OHIO SMELTING CO., 337 Hippodrome Bldg., Cleveland, Ohio.

STANDARD ELECTRICAL DICTIONARY—By Prof. T. O'Conor Sloane. Just issued an entirely new edition brought up to date and greatly enlarged—as a reference book this work is beyond comparison, as it contains over 700 pages, nearly 500 illustrations, and definitions of about 6,000 distinct words, terms and phrases. The definitions are terse and concise and include every term used in electrical science. 767 pages, 477 illustrations. (See page 18 for fuller description.) Price, $5.00. The Columbia Print, 1493 Broadway, New York City.

CUTTING AND WASHINGTON detector and 2-stage audio amplifier complete with tubes, B Batteries, Storage Battery (100 ampere hour), two sets phones, Dictograph Loud Speaker. Range, 2,200 miles. $75.00. K. C. Matheson, Box 186, Clinton, Nebraska.

SAXOPHONE, silver plated soprano, and Besson silver and gold plated CORNET, practically new, to sell or exchange for radio parts. W. Alton Clifton, Eufaula, Ala.

STAMP COLLECTORS! Free packet, all foreign, to applicants for 50 per cent. discount approvals. W. K. Rose, Fayetteville, Ark.

MAGNAVOX TYPE R3.—Latest curves, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kans.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,900 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, tape or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

CALLS HEARD POSTAL CARDS for DX reports. Station call letters in color. Printed on government or plain postals. $ .80 hundred up. "Used Everywhere—Go Everywhere." Write for samples. Radio Print Shop, Box 582, Kokomo, Indiana.

EDISON Elements for making "B" Batteries, 6c per pair; tubes, 2c each. Nickel Wire, Insulators and Cabinets at reasonable prices. TODD ELECTRIC CO., 178 Lafayette St., New York City.

Cram's Radio Broadcasting Map

of United States and Canada

With all the new allocations and changes recently brought out. Scale, 100 miles to the inch; in two colors—Size 34x28.

PRINTED ON HIGH-GRADE MAP PAPER WITH ALL UP-TO-THE-MINUTE INFORMATION BY WHICH YOU CAN LOCATE ANY BROADCASTING OR HIGH POWER STATION. A COMPLETE INDEX OF THE ARMY, NAVY AND BROADCASTING STATIONS.

The Most UP-TO-DATE MAP out!

35c. (Postpaid)

THE COLUMBIA PRINT

1493 BROADWAY, NEW YORK CITY

DID YOU GET THE VACATION NUMBER OF RADIO WORLD

It had page after page of interesting and practical ideas and hook-ups for people who are going camping, canoeing, yachting, or just vacationing up in the mountains. You really can't afford to be without it, if you intend leaving the city behind this summer and want to take your radio with you. Dated June 2. Mailed for 15c.

Radio World, 1493 Broadway, New York City

Fifty-two issues for $6.00. Subscription Department, RADIO WORLD, 1493 Broadway, New York City.

Construction of New Type Transatlantic Receiving Sets

By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

Sent P. P., prepaid, on receipt of price, by

THE COLUMBIA PRINT

1493 BROADWAY, NEW YORK CITY

HOOK-UP AND CIRCUIT HOUNDS

Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:

Good 2 tube WD-11 Circuit for DX	Jan. 27
Satterlee Circuit	Feb. 3
G. W. May's Wonder Circuit	Feb. 17
Multi-tube Reflex Circuits	March 3
One tube Superregenerative	March 3
Lewis Three Tube Circuit	March 10
Regenerative Radio Frequency Circuit for 5 tubes	March 24
Hazeltine Neutrodyne Receiver	March 31
2VK'S Transmitter circuit	April 21
Compact Universal Receiver	April 28
Stockelburg Pup receiver	May 5
Cockaday receiver	May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Rienartz	May 19

Any number for 15c. Any 7 numbers for $1.00. All 12 numbers for $1.50. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

Preparing for the New School Term

Radio World wants a representative in every grammar, high and preparatory school in the United States and Canada.

We have a special proposition that will enable representatives to make money. Appointments made now. Give name of school you will attend in the Fall.

Address Circulation Dept., RADIO WORLD, 1493 Broadway, New York City.

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MICROMETER ADJUSTING
CRYSTAL DETECTOR

Increases the Efficiency of Your Crystal Set!

Finer tuning, clearest possible reception, constant adjustment until you wish to change, then—"A Twist of the Wrist—It's Set." Excellent for reflex and other circuits. $2

Write for folder and name of your nearest dealer.

Wholesale Radio Equipment Co.
Exclusive Factory Representatives
37 William Street Newark, N. J.
Dealers and Jobbers Write for Attractive Proposition

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To the Man with an Idea

I offer a comprehensive, experienced, efficient service for his prompt, legal protection, and the development of his proposition.

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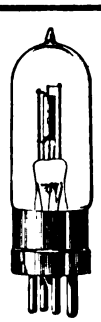

WE REPAIR
WD-11, $3.50
AND POSTAGE

Also other vacuum tubes, excepting VT-1 and VT-2.

Mail orders solicited and promptly attended to.

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514 Clinton Avenue Newark, N. J.

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Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition.
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MADISON SHIRT CO., 503 B'way, N.Y. City

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
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Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.
Add $1.00 a year extra for foreign postage. Canada 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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One page: One time—$150.00.
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Cover and preferred-position rates made known on application.
Terms: 30 days net. 2% 10 days.

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Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

President Harding Greeted

CAPTAIN DONALD B. MACMILLAN, who is somewhere north of Labrador on his way to the Arctic where he will determine whether there is to be another ice age, has sent a wireless message of greeting to President Harding, a copy of which was received at Hartford, Conn., by the A. R. R. L.

The text of the explorer's greeting, which was sent from his schooner, the "Bowdoin," in the vicinity of Jack Lanes Bay, Labrador, follows:

"Greetings from the crew of the 'Bowdoin' from the Atlantic to the Pacific. All hope that you are thoroughly enjoying your sub-Arctic trip."

This message was forwarded across the Continent by amateur radio.

Expecting Too Much

ONE of the editors of RADIO WORLD called by telephone a prominent manufacturing company whose name features the word "radio." When the connection was established, here's what happened:

Operator—"This is Siwash 4,000."

Editor—"RADIO WORLD speaking. Is Mr. Brown in?"

Operator—"I don't get the first word."

Editor—"Radio—RADIO WORLD."

Operator—"I don't get it."

Editor — "Radio — radio — R-A-D-I-O. You certainly ought to be familiar with that word."

Operator—"Well, I'm not. This is my first day here!"

RADIO
TUBES REPAIRED
$2.00

New filaments inserted in

U.V. 200—C. 300 ..... $2.00
U.V. 201A—C. 301A—U.V. 199—C. 299—D.V. 6A 2.00
U.V. 201—C. 301—D.V. 6 ..... 2.25
U.V. 202—C. 302 ..... 3.00

WD11-12, VT-1, VT-2, VT-216A Not Accepted

24 Hour Service, and on the Above Types ONLY.

Terms—Cash with order. We will ship C. O. D. if 1/3 price is remitted with order.

All tubes are guaranteed to operate like new and to arrive in good working order.

DEAL DIRECT ! !

SPECIAL—Ship us 5 of the above named tubes and we will ship by return mail one repaired tube FREE of all cost. What do you say? Swap?

Send all tubes parcel post prepaid to

Radio Tube Repair Co.
192 Main St., Milford, Mass.

The Niftiest Short Wave Tuner on the Market Only $6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

The Goodman is really a high grade instrument, well and sturdily constructed. The PANEL and FANS are GENUINE BAKELITE—the best material known for the purpose.

YOU SAVE 50% OF THE USUAL COST

WORLD RADIO
Batteries Are Guaranteed 2 years in Writing
Will ship C. O. D. subject to inspection, or allow 5% discount for cash with order. Order shipped same day received. WRITE TODAY.

2 VOLT STORAGE BATTERY for
WD11—WD12 $5.00
6 V., 60 Amps. $10.00
6 V., 80 Amps. 12.50

World Battery Co.
Dept. 17
1219 So. Wabash Ave.
Chicago, Ill.
6 Volt, 100 Amps. $14.50
6 Volt, 120 Amps. 16.00

YOU DON'T NEED Tubes to get out of town. Even in the summer I hear Omaha, Kansas City, Fort Worth and Davenport on my crystal set without amplification. Works over 1,000 miles in winter. Send self-addressed envelope for further information or $1.00 for complete copyrighted drawings and instructions. Everything clearly explained. Satisfaction GUARANTEED.
Leon Lambert, 562 South Volutsia, Wichita, Kan.

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FREE INVENTION RECORDING BLANK
Phone Vanderbilt 7313

FREE BOOK
MANUFACTURERS PATENT CO., INC.
520 FIFTH AVE
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Aetaco Back Mounting Inductance Switch

12 Points Sure Contact

For convenience in mounting the set and for continued reliable service, the AETACO back mounting inductance switch is unsurpassed. The AETACO trade mark is sufficient guarantee of its quality and workmanship.

AETACO Condensers

Fine Adjustment.	Accurate Spacing
43 Plate Condenser	$1.75
23 Plate Condenser	$1.35
17 Plate Condenser	$1.25
11 Plate Condenser	$1.00
3 Plate Condenser	60c.

Attractive proposition to dealers and jobbers.

American Radio Stores
236 Fulton Street New York City

DON'T WAIT

SPECIAL INTRODUCTORY OFFER

$26.98 BRAND NEW (Type R-3) Magnavox Loud Speakers $26.98

COREY HILL BATTERY CO.
1354 Commonwealth Ave. Boston 34, Mass.

Operator Mix of WNP (Wireless North Pole)

(C. Paul Thompson)

Donald H. Mix, of Bristol, Conn., amateur radio operator of the McMillan expedition to the North Pole. Amateurs will recognize him when they know that he is the old operator of Station 1TS. It is through him that listeners back in civilization will learn of the new discoveries and conditions existing around the North Pole.

10 DAY EXTENSION
SUNBEAM SPECIAL
DICTOGRAPH PHONES
$5.25

We supply information and prices on any set you may want to build, or we will build from your plans.

Send us your address—Get our Special Weekly Offerings.

SUNBEAM ELECTRIC CO.
71 THIRD AVE. 207 EAST 14th ST.
NEW YORK

AN AUDIO FREQUENCY TRANSFORMER THAT IS WORTH WHILE

ALEMCO

Specially designed to produce superior results with any standard tube. Produces maximum amplification without distortion or howling. Moisture, hard knocks and abuse will not affect its efficiency.

Windings completely surrounded with laminated iron and sealed in a non-inductive bakelite housing eliminating leakage. Adaptable to any stage of amplification.

Ratio 4 to 1

The Alemco Coil also gives equal or better results on the first stage than transformers on the market wound as high as 9 or 10 to 1. Will stand any voltage.

Price, $5.50 Postpaid

ALEMCO, Poughkeepsie, N. Y.

DO YOU WANT PLANS FOR MAKING THE SLEEPER DUOTOL RECEIVER, USING THE SLEEPER TWINS. —Two Variometers and the fixed Coupler? SEND 10c for the June issue of RADIO AND MODEL ENGINEERING.

SLEEPER RADIO CORPORATION
88 W. Park Place New York City

Subscribe for RADIO WORLD, $6.00 a year.

Six Months Subscription for Radio World and Popular Radio or Wireless Age, or Radio News or Radio Dealer or Radio (San Francisco) for the Price of a Subscription for Radio World Alone

This Is a Special Offer for the Summer Only:
DO IT NOW!

Radio World for six months (26 numbers) is.....$3.00
Popular Radio at 20c a copy for six months would be..... 1.20
$4.20

or

Radio World for six months.....$3.00
Wireless Age (or Radio) at 25c a copy, for six months..... 1.50
$4.50

Send us remittance for $3.00 and we will send you Radio World for six months and Popular Radio, or Wireless Age, or Radio News, or Radio Dealer, or Radio (San Francisco), for six months, to one or different addresses, or send through your newsdealer.

This offer is good only for one month from date.

Take advantage of this offer today and send in the accompanying subscription blank. If you are already a subscriber you can take advantage of the offer by sending us $3.00 and renewing your subscription for six months beyond your present date of expiration.

Special Combination Offer of Radio World and Popular Radio or Wireless Age or Radio

RADIO WORLD, 1493 Broadway, New York City.

Enclosed find remittance for $3.00, for which send me Radio World for six months, beginning with issue dated ..... and Popular Radio, or Radio News, or Radio Dealer, or Wireless Age, or Radio for six months beginning with issue dated..... .....and it is understood that there is to be no extra charge of any kind. Please mail copies to the following address:

If you wish you may send us $6.00 for Radio World for one year (52 issues), and Popular Radio or Wireless Age, or Radio News or Radio Dealer, or Radio for twelve months, both postpaid. This offer good only if mailed by September 10, 1923.

Name .....

Street Address .....

City and State.....

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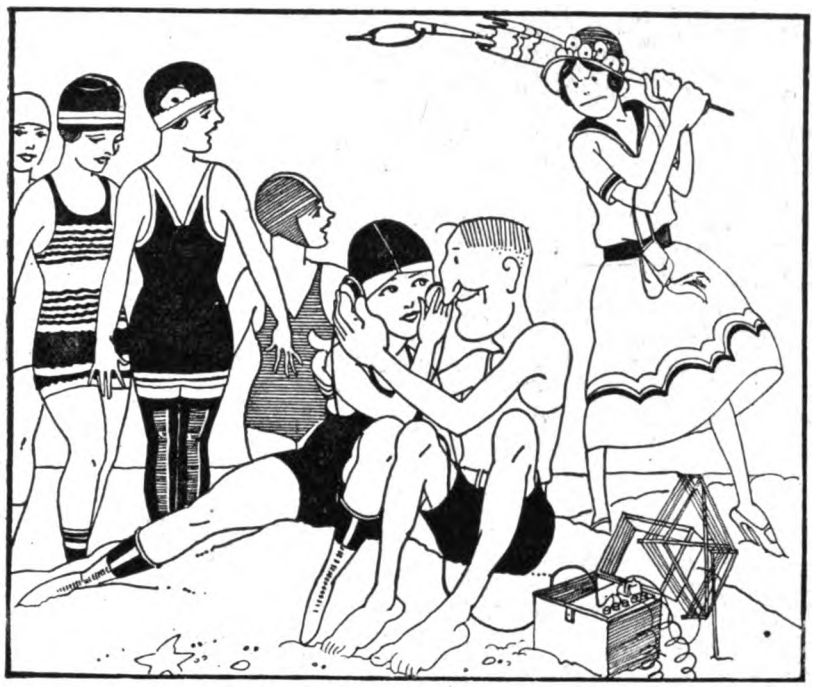
Broadcast Bill's Radiolays

By William E. Douglass



"When crack upon my dome came the blow of an umbrella."

SAKES alive! You should a seen me last week on a trip down East. Lots uf folks don't like to travel. I don't mind it in the least. Saw New York an' Coney Island, 'Lantic City an' the rest but uf all the places vis'ted I liked 'Lantic City best. Mebbe some uf you have been there. Like as not I'll go again. If I do I'll bet a dollar I don't tell nobody when. Lots uf funny things will happen when a feller starts to roam, things I never would uf thought uf in my peaceful quiet home. Why one day when I went swimmin' where the waves come rollin' in an' the sunshine, fer you know it, burns some blisters on yer skin. I attracted more attention as I sat there on the beach an' it wuzn't fifteen seconds till I'd spotted one fair peach. In the first place after swimmin' I thought I would rest awhile in the sand an' watch the bathers fer it seemed to be the style. 'Course I had my loop antenna an' my good ol' wireless set. I may leave my wife an' family but I haven't left it yet. Riggin' up the set as usual 'twuzzn't long till I "tuned in" on the local sendin station so I tuned an' with a grin sez to this here babe I'd spotted "Want to listen in with me?" "Sure" she sez (the smile she give me wuz as pretty as could be.) Since I only had one head set we were sittin' side by side, to myself I kept repeatin' "Let your conscience be your guide." 'Twuzn't long till there were others waitin' 'round so they could hear, an' my sentiments are always "Try to please the ladies dear." While I didn't mind their lis'nin', it wuz quite a pleasant duty, wuz it Radio attractin' them er just my style of beauty? Anyway I had a waitin' list of twenty-five er thirty. There were Genevieves an' Helens, Eleanors an' dainty Gerty. Things were gettin' mighty interestin' when crack up on my dome came the blow of an umbrella. 'Twuz a message "straight frum home." Next time I start out to travel, sometime I may go again to the seashore I'll just betcha I don't tell my family when.

—Copyright, 1923, Westinghouse Electric & Manufacturing Co.

Advertiser Reaches Army of Dealers with Radio World, a Fan Publication

SLEEPER
RADIO CORPORATION
88 PARK PLACE, NEW YORK

Radio World,
1493 Broadway,
New York City.

Attention of Mr. Clark

Gentlemen:—

Advertising is a wonderful thing but in some four years of experience in using radio and trade papers, we have never known of such instantaneous and far-reaching results as we secured from the full page back cover advertisement which we had in "Radio World" of July 21st.

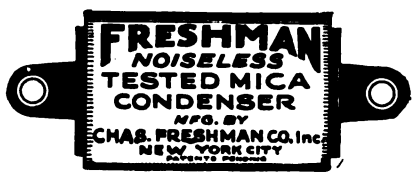
We chose "Radio World" as the quickest way of announcing the new Sleeper Monotrol which we have just perfected as the first commercial application of the Grimes Inverse Duplex Circuit. We expected that a great many would be interested in details of the new set and in the fact that Mr. David Grimes is with us as our Chief Engineer, but we never believed that such floods of letters could pour in on us so quickly. They came from practically every state in the union and what is most pleasing to us, over 60% are from dealers rather than individuals.

You are at liberty to use this endorsement of the advertising power of "Radio World" in any way you care to because you have given us results that other advertisers are entitled to know about.

Yours very truly,
SLEEPER RADIO CORPORATION.
(Signed) Gordon C. Sleeper, President.

July 27, 1923.

The Condenser Sensation of Modern Radio



Through the accuracy and dependability of Freshman Condensers, hook-ups and circuits have been perfected which have completely revolutionized the art of Radio Reception.

These little Storers of energy and rectifiers of Radio Current are the very heart of a well-built radio set.

The proper fixed condenser will make all the difference in the world in the reception, clarity and selectivity your set affords.

Capacity	Each	Capacity	Each
.0001	$ .35	.002	$ .40
.00015	.35	.0025	.50
.00025	.35	.003	.60
.0002	.35	.004	.75
.0003	.35	.005	.75
.00035	.39	.006	.75
.0005	.35	.006	1.00
.0006	.40	.01	1.00
.0008	.40	.015	1.50
.001	.40	.02	2.00
.0015	.40	.029	2.50

The FRESHMAN is so designed that constant equal pressure is exerted on the condenser plates over the entire area. They are the only condensers that do this and therefore the only condensers that avoid noises, which are due to variable pressure on the plates.

At your dealers, otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
100 SEVENTH AVE., NEW YORK

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proven best filament control

—challenges the world

Proven by every test to surpass any and all rheostats and filament controls, Fil-Ko-Stat rightly challenges the world.

Laboratory research proves Fil-Ko-Stat to have a fine adjustment area (which means ability to control filament heat and electronic flow) eighteen times greater than that of the wire rheostat and several times that of the next best filament control.

Actual use proves Fil-Ko-Stat the most acurate control for any tube from "peanut" to "power." Full resistance 30 ohms.

—it has no screws or adjustments to tamper with. It is triple tested and regulated at the factory to the ideal "off" position for

UV 200, 201, 201A, WD11, WD12, UV199, DV6A, W. E. Peanut, etc., etc.

—it is non-microphonic, operates noiselessly, eliminating all "frying."

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Editor Industrial Power, Chicago.

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HOOK-UP FOR DICK ROBERTS' "MIDGET" SET (See Inside)

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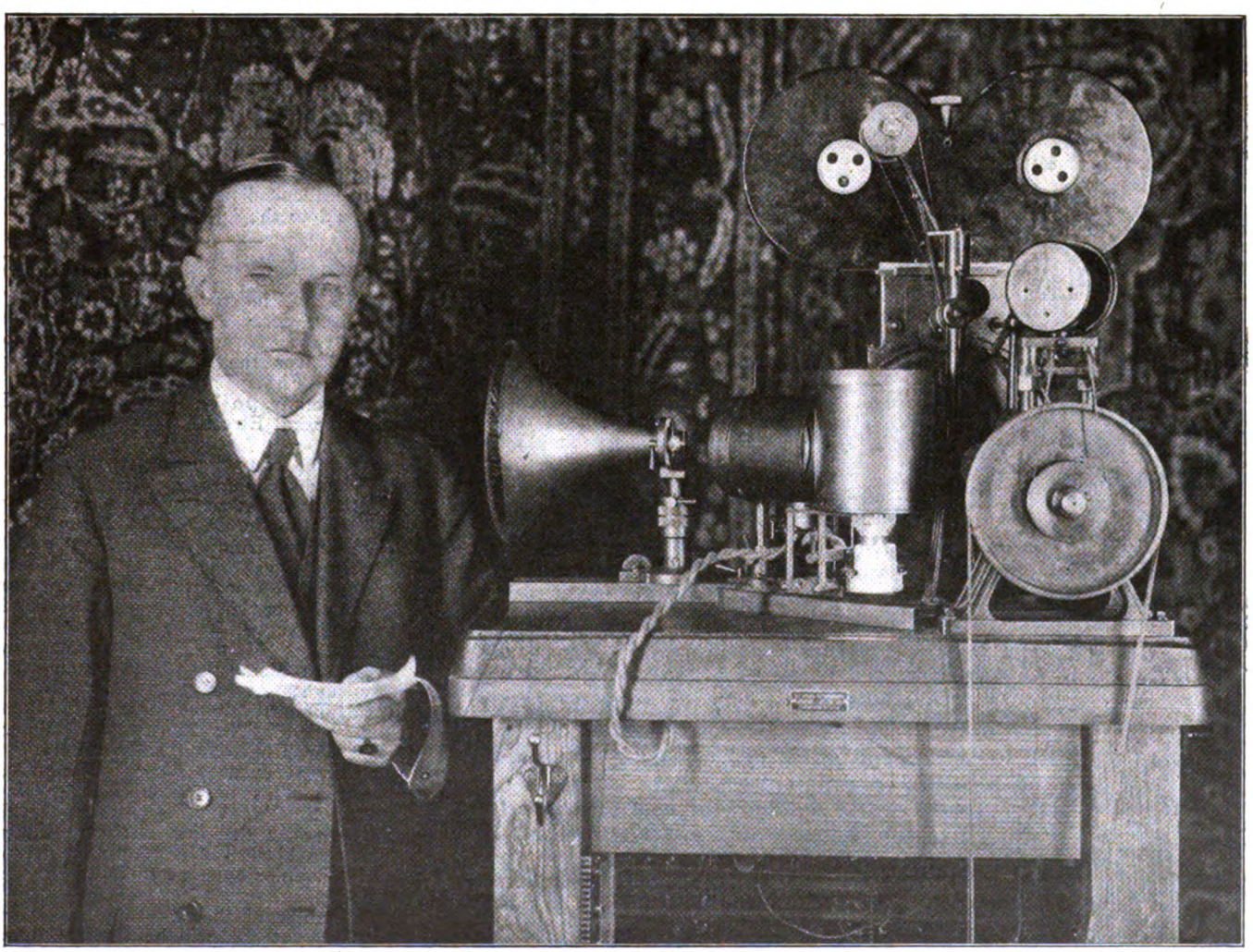
Title Reg. U. S. Pat Off.

ILLUSTRATED EVERY WEEK

PRESIDENT COOLIDGE IS A BELIEVER IN RADIO



President Coolidge, who is very much interested in radio and all modern scientific development, some months ago delivered an address from Station WGY, Schenectady, N. Y., while in person he was really in Washington, D. C. The means which made this feat possible was the "pallophotophone," a General Electric device which records speech on a moving film, which may be shipped to a distant point and the original speech broadcast from the film by radio

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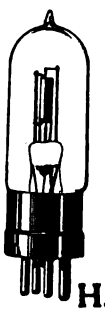

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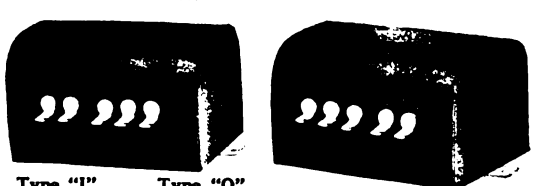

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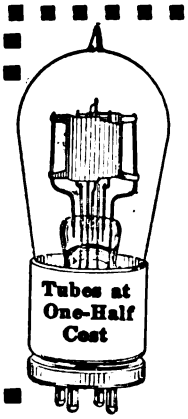

IT HAS HAPPENED TO ALL OF YOU IN A FRACTION OF A SECOND!

WHEN the filament burns out, at least $5.00 goes with it to put the set in operation again.

WHY not save nearly one-half the cost of a new tube by sending us your burned out or broken tube to be repaired?

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Westinghouse Stations Stand By on Friday

THE three Westinghouse broadcasting stations, KDKA, Pittsburgh, Pa.; KYW, Chicago, Ill., and WBZ, Springfield, Mass., suspended their entire broadcasting programs on Friday, August 10, National Mourning Day throughout the United States in honor of President Harding.

These stations remained silent during the whole day with the exception of Station KDKA, which broadcast a memorial service between the hours of 8 and 9 p. m. Many broadcasting stations throughout the country followed this action as a tribute to our late President.

Gen. Dawes in Tears as He Radios Harding's Praise

BROADCASTING his tribute to the late President Harding from the Edgewater Beach Hotel, Chicago, Gen. Charles G. Dawes broke down and cried as the final words died on his lips. He buried his face in his hands and his sobs went out to the mourning nation.

Gen. Dawes, who was called to Washington at the beginning of the Harding administration to establish the national budget system, completely won the President's confidence and was perhaps Mr. Harding's most intimate friend in Chicago.

Waiting his turn to speak, the man who made the "Hell and Maria" exclamation famous, was visibly under a heavy strain. When called he sat down at the microphone at Station WJAZ with grim determination on his face and began. His voice remained steady until near the end, when he referred to the love and companionship of President Harding and his devoted wife. Then his chin quivered and his voice broke. The few guests in the radio station sat in respectful silence until Gen. Dawes lifted his tear-stained face and arose with jaws set, again the soldier. He walked silently out of the little curtained room to a distant part of the hotel, glancing neither to right nor left, nor speaking a word until his wife, who followed, reached his side.

Station WBZ Broadcasts Harding Memorial Services

TWO memorial services by radio were the tribute paid to the late President Harding by Westinghouse Radio Station WBZ, Springfield, Mass., on Friday last; one in the afternoon at 2.15, broadcast from the city of Springfield Auditorium, and the other from the Kimball Hotel Studio at 8.00 p. m.

In the afternoon, the services began with ten selections on the Municipal Chime played by Bell-ringer Ernest N. Bagg. The first number was "America" and the last, "Taps." The numbers intervening were the President's favorite hymns.

After the chimes called the people of Springfield to the service, Municipal Organist Arthur Turner gave a number of appropriate selections. The meeting was opened by Acting-Mayor Frank Kinney, and prayers and addresses by prominent ministers and men of Springfield followed.

Microphones in the hall picked up the music and speeches and they were sent to East Springfield to the radio station where they were broadcast.

In the evening a similar service was given which allowed the people at distant points to hear the service. It was conducted by Rev. Stanley F. Blomfield and the music was furnished by the Springfield Conservatory of Music.

The regular musical program scheduled for the evening as well as the business talks and bedtime story for the children were cancelled so that due homage could be paid to the late President.

Forthcoming Program at WGY

SUNDAY morning, August 19, the Rev. Dr. George Alexander, pastor of the First Presbyterian Church of New York, will deliver the sermon at the service of the First Presbyterian Church of Schenectady, to be broadcast by WGY, the General Electric Company radio station.

For the convenience of farmers WGY has made changes in time schedule of produce market reports, harvest and regular weather forecasts. These reports will be sent out from 12:01 to 12:20, eastern standard time.

Ray Halse's orchestra will offer a program of popular dance music Monday evening, August 20.

Members of the WGY Players will present a Shakespearean program Tuesday night, August 21. Readings from "Midsummer Night's Dream," "Romeo and Juliet," "The Merchant of Venice" and "Twelfth Night," will be given.

Thursday evening Rogers Whitmore, a young violinist of Ilion, N. Y., will be featured. Mr. Whitmore was awarded the prize at the Fontainebleau Competitions in 1922. Jud Landon will give one of his popular open-air talks on the same evening.

A feature of the program Friday evening, August 24, will be the appearance of Adelbert Purga, thirteen-year-old violinist. At the 10:30 o'clock program on the same evening, Pietro Della Ratta will give several numbers on the piano accordion.

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 21. Whole No. 73 **August 18, 1923** **15c. per copy, $6.00 a year**

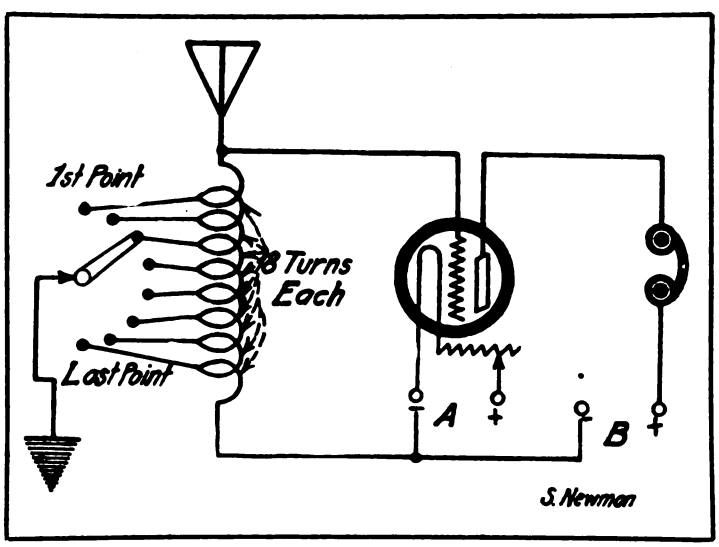
Construction Details of My Midget Set

By Dick Roberts

IN response to many requests, received personally and by RADIO WORLD, for the circuit diagram and constructional details of the midget set described in RADIO WORLD, July 21, 1923, I am furnishing all the necessary details with circuit diagram so that any of the readers of the magazine may, with the aid of the pictures and circuit, build the set.

The coil is bakelite, 2″ in diameter and 2″ high, wound with 80 turns of No. 28 wire. It does not matter much what insulation is used as long as it is safe. Tap every eighth turn, and after winding 56 turns start back on the coil and wind 24 turns more over the first 56, tapping as before. The last turn of wire will be about half way down the coil, and the antenna is connected to the last turn of that second winding.

Great care must be taken if success is wanted to see that there is no chance of a short circuit. The set being built in such small proportions, it necessarily crowds everything and makes it hard to make all the wiring safe, if the utmost care is not taken.



Circuit used in Dick Roberts' midget set. It is the conventional straight audion circuit using a tapped coil for inductance. If care is taken in the construction and wiring, a very neat and capable set will be the result.

As for the particular apparatus employed I used a Signal socket mainly because it was the only one that I could get in town that had a base and terminals that would allow such construction. The rheostat is a Fada with a 2″ dial. Any switch lever will do, but should necessarily have a small arm. The switch points are the ordinary tap points, but the rear extensions are cut short, after they are fastened on by means of the nut. If this is not done, they will protrude and interfere with the placing of the coil. The jack is a Chelten, with part of the insulation cut off to prevent it from hitting the coil. The binding posts are the smallest ones I could get and were purchased at a local Five and Ten Cent store. The panel is a piece of hard rubber taken from an old storage battery jar, although any panel material can be used.

In operating the set it will be found that the right amount of B battery will have to be found according to the particular tube used. With the tube I used (UV200) I found that about 18 volts were correct when the battery was new, moving the tap as the battery ran down. Particular care will have to be taken with the filament current, as it is important in the tuning of the set. Stations that cannot be heard with one adjustment can be brought in simply by varying the filament voltage. I found that stations within 400 miles come in on the third to fifth tap, according, of course, to their wave length. Kansas City, Mo., comes in on the third tap, and St. Louis, Mo. (both the same distance), comes in on the tenth tap. Volume of the signals can be varied by both the switch and the filament.

Too much care cannot be taken in the construction of the set if good results are wanted. I personally took an entire night planning the efficient wiring of the set before I heated the soldering iron, and then wired it up just as I had planned. Due to the fact that the set is small there are plenty of ways of wiring it, but the builder will, if he thinks, find one or two ways that will probably enable him to use an inch or two less wire, and that will increase the efficiency of the receiver.

Paraffine Is Useful

MANY fans do not realize that paraffine is extremely helpful and useful around a radio set. Its use will sometimes improve reception many times.

Instead of shellacing the windings of coils, dip them for a moment in paraffine that is boiling hot, and allow them to drip until all the excess paraffine has been removed and there is just enough to hold the windings firm.

Instead of spaghetti for insulation, especially around a receiver, the use of a roll of tubular tape, such as can be obtained at the five and ten cent stores, and which women use for drawing strings, if dipped into paraffine and left to dry is suitable, and much cheaper.

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Radio Broadcasting Station WKAQ San Juan, Porto Rico

By J. Agusty

WKAQ is the radiophone broadcasting station of the Radio Corporation of Porto Rico, affiliated with the International Telephone and Telegraph Corporation of 41 Broad street, New York. It is located in the center of the city of San Juan, Porto Rico, and its geographical position is Latitude North 18°-25′-4″. Longitude West 66°-6′-57″.

The station occupies four rooms—the studio, reception, operating and power rooms. The transmitter is the standard Western Electric 500 watt with two 250 watt oscillators and two 250 watt modulators. There is also a 50 watt speech amplifier. Actual radiation

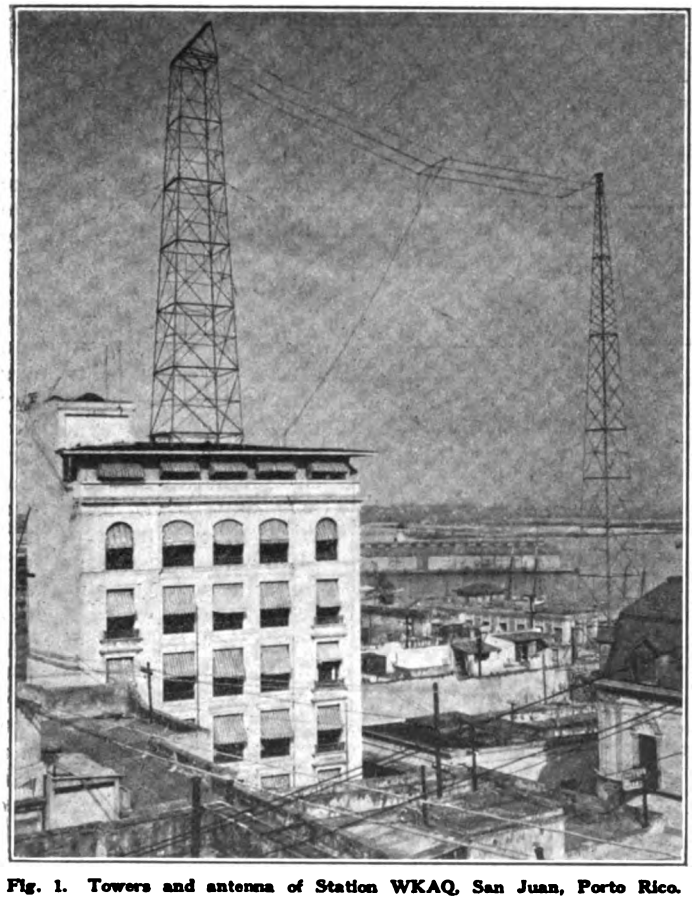

Fig. 1. Towers and antenna of Station WKAQ, San Juan, Porto Rico. The station is owned by the Radio Corporation of Porto Rico and is located on the roof of the telephone building.

on 360 meters is 6¾ amps. The well-known system of modulation is used.

The station is situated on top of the telephone building. On the roof is a steel tower 87 feet high supporting one end of the three-wire antenna that runs 90 feet horizontally to another tower 187 feet above the street level. The lead-in comes from the center, giving a "T" type aerial.

The first broadcasting was done in August, 1922, but the official inauguration was held on December 3, 1922.

The studio of WKAQ, similar to all broadcasting studios, is a room different from all ordinary rooms. Walls and floor are covered with heavy curtains and carpet to deaden echo. In one corner near the ceiling is a red lamp which is in series with one in the reception room and another in the operating room. Under each of these lights there is a framed notice which reads: "When the red light is on, the slightest sound is picked up by the microphone and broadcast. Please keep quiet."

In the operating room are located the transmitter which includes the speech input amplifier with its monitoring horn, the power panel to control the power, the regular transmitter and the receiver. This room is the place for the operator in charge of the station.

The reception room in this station is also the office of the station's manager. Here the artists who take part in the program await the call to the studio.

The power room is apart from the studio to eliminate all possible noises. Here an Ecko motor-generator of three units, supplies the necessary power for the transmitter. There are two sets of Exide batteries to light the filaments of the speech input amplifier and receiver tubes. Also the batteries supplying the plate potential.

WKAQ has been heard in every state of the United States, Canada, West Indies, Mexico, Central America and South America. An interesting thing is that most of the letters received indicate that this station has been heard perfectly clear through the roar of the broadcasters in the United States.

Porto Rico is now an established part of the radio world. It had already joined the mainland by amateur radio telegraphy through the remarkably efficient efforts of the local division of the A. R. R. L. And now just as our sister island Cuba has carried the music and the spoken word of Cuba into our world-wide common property, the ether, so has WKAQ introduced Porto Rico to the broadcast listeners of this hemisphere.

Radio Reports the President's Death

By Carl H. Butman

WASHINGTON, D. C.—For the first time radio played an important part in the dissemination of news of a national character, when President Harding died in San Francisco on August 2. The President's death occurred at 7:30 p. m., Pacific time, and the Associated Press had the story out within five or ten minutes, the report being received at the Washington office of that organization at 10:55 p. m., Eastern standard time, or 25 minutes after President Harding died.

The first intimation the general public had of the President's death, however, was when various newspapers having broadcasting licenses sent out the Associated Press dispatch. Among the first papers to get on the air with this important news was the Memphis *Commercial-Appeal*, whose announcement was the first word Washington listeners-in had of the event.

The news by air that the President had died, resulted in a great number of telephone calls to the newspapers and various offices of the Associated Press throughout the country. As a result of the broadcast announcement, the news of the President's death was generally known from 30 minutes to two hours before the newspapers in the larger cities were out with extras.

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Army and Navy to Use Radio in War Games

By Washington R. Service

WASHINGTON, D. C.—Assistant Secretary of the Navy Roosevelt has a unique idea for the use of radio in army and naval war games. He proposes the joint study and solution of a problem involving combat operations, such as an over-seas expedition, by the war colleges of the army and navy simultaneously, every move being radioed to umpires meeting in the War or Navy Departments near their radio central offices.

War games are old, but Colonel Roosevelt's idea is to bring the land and sea postgraduate war schools into a closer relationship during peace times when they have time to work out problems involving both arms. Military and naval forces would be operated theoretically on paper, just as they would co-operate in time of war.

Since the Naval War College is located at Newport, R. I., and the War College of the Army in the Capital, it would be expensive and difficult to bring all the students into one large hall for the joint study of intricate war operations. Therefore, he suggests that the students remain in their respective class rooms, where all facilities such as books and tables of reference, maps, charts, etc., are available, and as fast as orders, plans and movements of troops or ships are made, to radio the action to the board of judges sitting in Washington. The army and navy officers acting as umpires would have two charts in their meeting place and plot every move made by the students at each school.

Upon the completion of the "game," which might require a week or ten days, the umpires would decide which of the schools had solved the problem correctly or to the best advantage and announce the result by radio to the students.

It would not be a contest between the army on one side and the navy on the other, but would involve the handling of both sea and land forces. The naval class would be divided, one handling the Red forces, the other the Blue, while the army school would also fight out the same problem, dividing against itself. Such studies, naval officials believe, would tend to familiarize naval officers with the military end of war problems and army students with the marine side of such conflicts, effecting closer co-operation and understanding of combined national defense.

Fig. 2 (upper left). The power room of Station WKAQ, San Juan, Porto Rico. Fig. 3 (upper right). The speech input amplifier at Station WKAQ with operator on watch. Fig. 4 (lower left). Studo of Station WKAQ. J. Agusty, the author of the article on page 4, is standing near the microphone. He is also the manager, announcer and program director. Fig. 5 (lower right). Operating room of Station WKAQ, with Operator Camuñas checking the wave length.

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In One Year Radio Stations in U. S. Increase 1126

By Carl H. Butman

(*Copyright* 1923)

WASHINGTON, D. C.—The end of the fiscal year shows a gain of 1126 radio stations of all kinds in the United States, according to the Department of Commerce figures just compiled. On June 30 there were 21,967 ship and land radio stations, whereas a year ago there was a total of 20,841. The increase represents added interest among amateurs and broadcasters who have taken out station licenses during the past twelve months. Amateur stations increased from 15,504 to 16,570 on June 30, showing a gain of 1,066. Broadcasting stations number 191 more today than a year ago, having increased from 382 last year to 573. On June 30, 1923, the official tabulation was as follows:

	1923
General and restricted amateurs	16,570
Special amateurs	178
Trans-oceanic stations	12
General public service to ships	45
Point to point stations	179
Broadcasting	573
Technical and training	127
Experimental	261
Ship stations, commercial	2,723
Government ship, inc., Navy and Army	1,009
Government land, inc., 24 light ships	290
Total	21,967

Interest in amateur activities is indicated by the following table which shows the gains by districts in the past three fiscal years:

Amateur Radio Stations

Districts	Headquarters	June 1921	June 1922	June 1923
1	Boston	2040	2489	2139
2	New York	1880	2348	2055
3	Baltimore	1325	1857	2005
4	Atlanta	208	341	449
5	New Orleans	418	758	948
6	San Francisco	1136	1756	1957
7	Seattle	504	753	864
8	Detroit	1615	2354	2013
9	Chicago	1683	2848	3340
	Totals	10809	15504	16570

Development of Broadcasting

By S. B. Davis

Assistant Secretary, Department of Commerce

WE meet tonight to welcome the youngest member of the radio family, which is to devote its life to what we now call "broadcasting," an activity so new that the word itself, in its present significance, was unknown only a few years ago. The family has been of rapid growth, but it is not of the mushroom type to flourish but a moment and then perish. We who listen nightly to the messages that entertain and instruct us accept them more or less as a matter of course, without much thought of either their mystery or their novelty; but no prior discovery has ever seized the public mind and sprung so rapidly into general popular use as has radio.

The first license authorizing a station to broadcast was issued in September, 1921, less than two years ago. Tonight, with the entry of this latest station into the field, there are five hundred seventy-three stations in this country authorized to broadcast. Born in the United States, broadcasting has largely retained its Americanism. Foreign countries have adopted its English name into their language. In all the rest of the world there are only sixty-three such stations, and of these, thirty are in Canada, our nearest neighbor. How many people receive their messages no one knows, but in our country alone they are numbered by the million. Never since the first letter was printed from movable type has such a huge stride been taken to make information freely available and to put knowledge and education within the reach of all.

Since the day when the savage sent his messages by signal fires and beating drums man has been striving to conquer distance. He has dotted the earth with his railroads and automobiles and the sea with his ships in his effort towards the more speedy transportation of person and property, and at last for the same purpose he traverses the skies. * * * Radio now supplements the telegraph and telephone; it has become the voice of ships; it bridges uncharted seas, and spans unsurveyed distances on land. It brings the church, the market, public speech, music and instruction into our homes. This most scientific of modern discoveries has become a household factor of common use. The human voice carries with it the elements of personality, force and earnestness, vital to any plea, far more effectively than does the printed word.

Broadcasting conveys the expressed thought of one to the minds of many. It is a unique means to that end, and it is unique again in that, in most instances, whatever future development may be, it now has small direct commercial value. Measured in dollars and cents of profit to the transmitter its worth in most cases is small; measured in terms of service its value cannot be calculated. I doubt if there is in the world another activity involving so great an effort in science and invention and such an immense actual expenditure of money in installation and maintenance, not founded on the expectation of immediate financial profit.

Under existing laws, enacted by the way, some years before broadcasting had been heard of, our government regulates the transmission of radio messages of all kinds. At first devoted largely to the protection of life at sea, that regulation of late has been particularly

(*Concluded on page* 10)

Abstract of an address made at the opening of Station WRC, Washington, D. C.

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A Little Wonder Portable Set

By Byrt C. Caldwell

THIS wonderful little set is easily constructed and gives results equal, and usually better, than full-sized sets. This is due to its extreme compactness. The U. V. 199 and C. 299 make this set possible.

The first requirement is the containing box. It should be made from quarter-inch stock, and should be about 3"x5"x7" outside dimensions. All the instruments and binding posts are mounted on this, and the heads of the screws should be countersunk and the holes filled up with filler. It should then be sandpapered, varnished, and polished. Or it may be finished by covering with black velvet. Either way makes a beautiful set.

The inductance is a 50 or 75 turn spider web coil, which can easily be constructed from instructions to be found elsewhere. It is fastened to the bottom of the box. The condenser is of the book type, as compactness is required in this set. It is placed on top of the inductance. The shaft projects through the side of the box, and a small knob is used instead of a dial.

The tube is mounted on the side of the box, and the variable grid leak and condenser, the rheostat, and the "A" battery, which is a 4½ volt flashlight battery, are placed as shown.

The "B" battery consists of eight 3-volt flashlight batteries connected in series, and fastened to the cover of the box as shown, by means of thin strips of brass. This battery is connected to the rest of the set by means of flexible wire, so that it is not broken when the box is opened. When mounting these, be careful

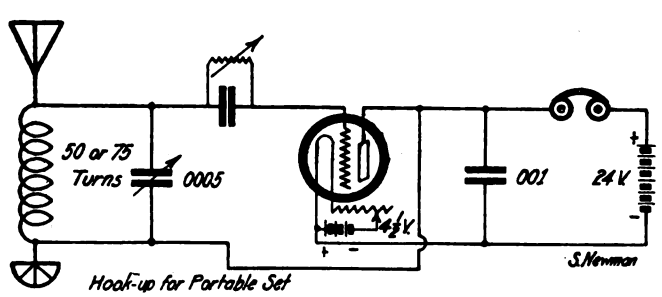

Fig. 1. Diagram of circuit used in the little portable set described herewith. It is the ultra-audion circuit which is very selective and easy to control.

that they do not touch the edges of the box, or any of the instruments when the box is closed.

In this set, a counterpoise is used in place of a ground, as being more efficient and more convenient. Two 100 foot lengths of No. 22 enameled wire are wound, each one on a spool, and placed in the box as shown. Heavy elastics are used as insulators. The wire specified should be insulated, so that in case the antenna touches a tree or some other conductor when it is hurriedly strung up, there will be no loss of energy.

The phones are to be connected to the two binding posts shown. They must be carried outside of the set, unless a pair of the very small sized phones which are seen on the market are used, in which case, plenty of room on top of the movable condenser plate and the rheostat may be found for the phones.

When the set is to be used, unwind the spools of wire, string one as high as possible, and connect it to the upper binding post in the diagram. Suspend the other a few feet from the ground, and connect it to the other post. Then light the filament and tune with the condenser in the same manner as you tune your large set, provided, of course, that you tune this properly.

The same general rules for wiring all sets apply in this set as well. The only difference is that there is a better opportunity in this set for short straight leads than in a large set where the instruments are spread all over a panel. The wiring is not shown in the

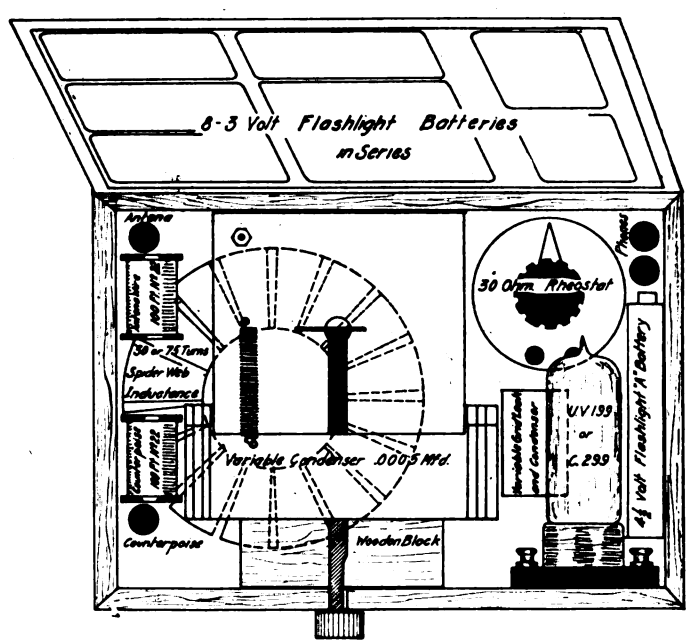

Fig. 2. Layout suggested for the receiver described. The batteries can be placed in the cover of the box and connections made with flexible wire.

diagram, as this would probably lead to confusion. The hook-up given is the usual single circuit regenerative. The set is easily wired from this hook-up.

This set is one of the most easily constructed you can imagine, and it gives wonderfully consistent results over distances of a thousand miles and more. The new peanut tubes make it possible to construct this beautiful little completely self-contained set which fits into a pocket, and yet gives results equal to the most elaborate of home sets.

Do You Dust It?

SUMMER time is lazy time. You are naturally lax in all things, but you should not forget to use the dust cloth and duster on your set. If dust collects, it will short the set and cause innumerable little by-paths for the minute currents, and your receiving range will be cut down enormously. When working inside the set it is best to blow the dust out with a rubber tube, as then you will not chance breaking wires.

Painter, Attention!

THERE are many amateur builders who, after they have constructed a set, will give the cabinet and base a healthy coat of nice looking finish. Nine times out of ten the paint contains some lead, zinc or other metallic oxide which will form a nice leak for the set. Clear varnish, or shellac, is best for this purpose—or alcohol stain and wax polish for the finish.

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Invisible Singers Entertain Boy Scouts by Radio at Camp Glen Gray

By Gilbert Bonnell

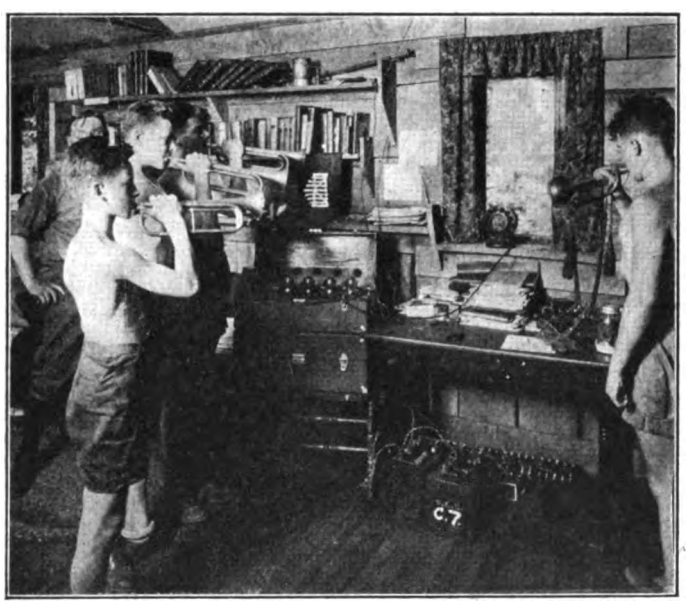
RADIO is the great boon of boys, particularly those who are members of the world's largest boys' organization, the Boy Scouts.

Boys are ardent radio fans; they find rare enjoyment and entertainment in the ether, they sport with its waves as do skillful swimmers in the sea.

Radio has done more than anything else to relegate lurid dime novels to the limbo of discarded things, for its popularity with young America has brought into being the excellent publications that boys read avidly.

Radio justly deserves the important place it occupies in Boy Scout camps throughout the length and breadth of the land.

A notable example of how radio plays a leading part



(C. Western Electric Co.)

Bugle call at Camp Glen Gray, the Boy Scout Camp at Oakland, N. J. A Western Electric Public Address System amplifies the bugle calls so that they are heard all over the camp. In the picture are Gordon Gavan, of Montclair; Douglas Pease, of Upper Montclair, and Edw. Veleau, of Montclair, N. J.

in the program of the camp day is at Camp Glen Gray, the Montclair Council Camp in Bergen County, New Jersey.

There in the Ramapo Hills where the red man's watchfires once gleamed is the campfire of the first Boy Scout troop organized in the United States.

Around that campfire the Boy Scouts of Montclair, Glen Ridge and Nutley, nightly gather and listen to the voices of invisible singers miles away across the mountains. As a matter of fact the boys could as easily hear the singing in any other part of the camp for radio programs are made clearly and distinctly audible over all of Lake Vreeland and the full length and breadth of the camp situated on the lake shore.

This is accomplished by means of the Western Electric No. 3 public address system which P. M. Rainey and R. M. Hatfield, of Montclair, brought to the camp where their sons are sojourning.

This system, while compact, is capable of amplifying radio reception some several thousands of times without distortion. It is a vacuum tube amplifier similar to, but smaller than the one which made President Harding's inaugural speech audible to the largest assemblage that ever heard any inaugural. It is mounted in a hardwood cabinet containing an insulating panel upon which are mounted four vacuum tubes and the necessary transformers, resistances, condensers, switches, etc., for three stages of amplification.

The public address system may be used to amplify radio received programs or, when connected with the microphone, it may be used to amplify local speeches, vocal and instrumental music.

The microphone which picks up the voice or music is the same as that used in the larger public address systems.

A group of horns is mounted on the balcony of Mothercroft, the recreation hall at Camp Glen Gray. These horns are exactly the same as those used in the Yankee Stadium when a public address system made the announcements at the Willard-Johnson fight audible to 74,000 fight fans. The horns uniformly and distinctly carry the amplified voice or music over the area it is desired to cover at the camp.

Camp Glen Gray was established in 1917 by "Uncle" Frank F. Gray, who organized what is the oldest Boy Scout troop in this country, Troop 4.

The camp is located on the shore of a lake in the Ramapo hills, about four miles from Oakland, New Jersey. This section of the country was deserted in '49 by the settlers who went to California in the gold rush. Today it is a veritable forest primeval.

The camp consists of a spacious mess hall and kitchen, a large recreation hall, the hospital, the director's cabin, a store and long streets of tents. Each boy has a tent all for himself.

The camp is governed by the boys. They have their own mayor and ward leaders. "Co-operative discipline" is a feature of the boys' form of government. The boys can make an all day hike on their own land for the Montclair Council Camp's tract covers approximately 500 acres.

The Cannon Ball Road—so-called because the Tories in yesteryears hauled cannon balls over it from Pompton to Westpoint—passes through the property. Today the ruts worn by the wheels of the Tories' carts are obliterated; the old road is but a trail leading to the lookout from which, on a clear night, the lights of Manhattan Beach can be easily seen.

The camp day at Glen Gray begins promptly at 7:30 o'clock in the morning when the bugle's peremptory notes are sounded. Now that the Western Electric amplifier is available the buglers "boost up the range of their lung power" by using the apparatus to amplify the calls.

The boys turn out at the bugle call, stand at attention while the flag is hauled aloft. Then they go through setting up exercises that start their bodies tingling. After the calisthenics they may take a dip in the lake or retire to their tents until breakfast. Mess over, squads are assigned to various duties.

Frequently "Uncle" plays his piccolo before reveille. This music is also clarioned by the public address system and flung far into the forest surrounding the director's rustic cabin.

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At 11:00 the boys may begin to indulge their aquatic propensities and for three-quarters of an hour swim and dive in the crystal clear waters of Lake Vreeland. Mess at noon is followed by recreation periods, including the day's second swimming period at four o'clock.

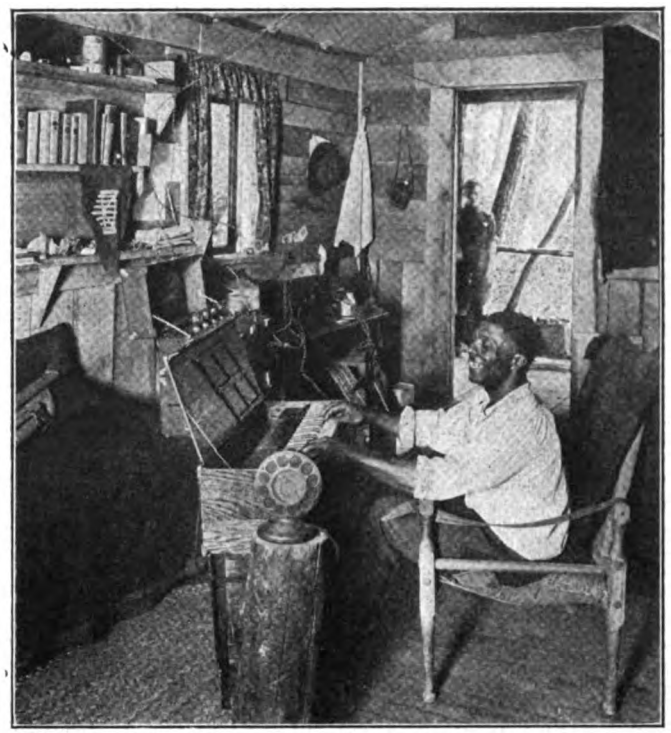
Sometimes Dave, the colored cook, gives the boys a musical treat. He is a clever manipulator of the stops and keyboard of a portable organ and he possesses a good singing voice as well. His organ recitals and renditions of songs of the sunny Southland are enjoyed by the boys equally as much as are his clever culinary concoctions. Nowadays Dave "does his stuff" with the microphone of the public address system close by. He smilingly says, "Ah knows everybody'll sure enough hear me when ah's got that in front."

At retreat (5:30) the flag is lowered with appropriate ceremonies. At this time new details for the following day are appointed. After evening mess the boys play games or roam about the camp streets until dusk. Then they assemble at the campfire. Here again radio made audible to all the assemblage by the sound amplifier, is used to entertain the boys.

One of the treasured traditions of the camp is that the campfire is kept burning from the hour the first contingent comes to camp until the last departs. A log is pulled out of the final fire before it is extinguished and this charred chunk is kept until it is used the following year to kindle the new fire.

At 9:00 taps is sounded. After taps "Uncle" plays several classical selections on the phonograph. This music, too, is amplified just as radio lectures are during the day. Religious services are held every Sunday night at the campfire. Last Sunday morning the sermon broadcast from St. Thomas' Church, New York City, was amplified.

The scouts at Camp Glen Gray are ever working to win merit badges in the various subjects for which badges are awarded. Some of the most important subjects are radio, life saving, first aid, sanitation, forestry, zoology and trailing.



(C. Western Electric Co.)

Dave Simmons, the chef, regales the Boy Scouts at Camp Glen Gray, Oakland, N. J., with organ recitals and song renditions which the boys claim are as good as his culinary concoctions. A Western Electric Public Address System carries Dave's efforts to all parts of the camp.

How to Cure the Squeals

By E. L. Kemp

I WOULD like to tell the "homebuilders" something which may put them wise to handling some of their "weak stations."

I am a "homebuilder," too, and owe my success to RADIO WORLD, to which I am a subscriber. In nearly every issue some one tells us how to tune our sets, but in every such case something is always left to be guessed at or worked out by us. As an instance: We are told that the best point at which to adjust our grid leaks for maximum reception is at the point where the scratchy scream is highest. They state in concluding that this adjustment is now final for the tube used and should be left there.

Ah! They are right, *so long as our B battery current remains the same!* But—if you use a variable B battery and step it around on different stations, say from 22½ to 45 volts, then I find that O. M. Grid Leak cries out.

You don't have to lose your station when making adjustments if you follow the plan that I have found out works best. Suppose you have a DX station and it is very weak. You step up your B battery and adjust your other controls, but the music or talk is still weak, if it does not fade out in a bunch of squawks.

Try this: See what your antenna condenser reads and then turn it completely to zero. Adjust your grid leak to that high point and then leave it, after you have gotten your signals in loud enough. Then turn your condenser back to its former position and note the increased strength of the signals. All the other controls need not be touched.

I hope that I have helped some of my fellow "homebuilders."

Mix Radios His Mother from the Arctic

WATERBURY, Conn.—Ten minutes was the record time consumed for the sending of a radio message from Donald B. MacMillan's Arctic-bound schooner "Bowdoin" to Bristol, Conn., via a local amateur station, and the relaying of a reply back to the ship which is northeast of Labrador.

The prophecy that the radio installation on the "Bowdoin" could be utilized by members of the crew to communicate constantly with friends and relatives at home has proved true and has become a fact.

The message in question was a personal greeting from Donald H. Mix, radio operator with the exploration party, to his mother in Bristol. Communication was established with WNP, the Bowdoin's radio shortly after midnight by Allen C. Lawson here, who immediately called Mrs. Mix by telephone. The reply was soon on its way north and Lawson heard Mix acknowledge its receipt with thanks.

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The Radio Woman

IN answer to a frantic appeal for more or less expert assistance, I called on a little friend of mine recently, who earns her living by frolicking now and then for the edification of the T. B. M. on one of the well-known vaudeville circuits. She had a radio set, newly purchased and hooked up, and thereby hangs this tale.

"I bought this thing-um-a-bob yesterday," she snarled sweetly, "because it seemed like a good chance to get my picture in one of these radio magazines, and as my press agent says, 'Publicity is publicity.' But now," she wailed plaintively, "I can't get the dawgone do-hicky to do its stuff. What's the idea of the thing? What do you turn, and how many times do you turn it, and in what direction, and how much, and why? Do you see this funny little knob? Well, I've turned it and twisted it, and swore at it softly, and in loud, vulgar accents, and I've coaxed it with soothing words, and have done everything else but kick it out of the window, which will be my next move, and yet I can't make the set do anything more than just squeal and moan and sigh as though it were two cats instead of one. What do you know about these things?" she queried belligerently, as though challenging my advice before it was offered. "The man who put the darned thing here said that it was in perfect condition and he got something or other on it for me, but as soon as he left everything went away from here—including my patience. What's the matter with it? I haven't moved a thing, except this funny little wire, which I thought would look much cuter if it were strung over on this side of the table instead of under it."

Well, talk about hysterics. I never was nearer to them in my whole life. The little dear had very deftly removed the antenna lead from the set and connected it on to one of the B battery leads. No wonder she was getting squeals and howls. I connected it to the right post and under sentence of death forbade her touching any wire until she had read the instruction book thoroughly and undersood just what was what. "Why, you might blow up your tubes," I said, "and they would scatter glass in your face and ruin your theatrical career," thinking that a good scare would teach her to use more care.

"Oh, take it away from here. I thought it was perfectly safe. I won't have the blame thing in the house if it is going to behave like a gasoline tank with a lighted match." And then I had to take an hour and explain that there was no danger, but that I simply wanted to throw a scare into her to make her remember not to fool and fiddle with the little "do-hickies" on the back of the cabinet.

After I got it working nicely and had shown her how to "get the blamed thing to work," she thanked me and told me that anytime that I was down in the "bright light" section of town to run in and she would show me the "ins and outs" of the theatre backstage.

RADIO PRIMER

THE ELECTRONIC THEORY—The electronic theory is frequently quoted in regard to the operation characteristics of vacuum tubes. A discussion of the theory in a semi-popular manner would clear up in the minds of amateurs in the science a very puzzling situation and in a manner make clear what happens on the inside of a tube when the filament is lit.

An electron to begin with is the smallest known particle of negative electricity. According to Webster an electron is defined as follows: One of those particles having about one-thousandth the mass of a hydrogen atom, which is projected from the cathode of a vacuum tube as the cathode rays, and from radioactive substances as the beta rays.

The electron is therefore found to be an electric carrier that has a negative charge. It was discovered by Edison some years ago that a filament enclosed in a vacuum threw off negatively charged particles. These particles were found to emanate in all directions from a heated filament, with terrific velocity, the amount given off being dependent upon the heat of the filament.

Applying the same principle to the vacuum tube, it can be seen that the action occurring within the tube is somewhat as follows: The filament is heated, giving off an innumerable quantity of these negative charges. The plate of the tube naturally has a positive charge and as unlikes attract, the negative electrons bombard the plate.

The grid of the tube, which is placed between the plate and the filament periodically changes from negative to positive polarity, according to the condition existing in the grid circuit at the time. When it is positive, it closes all paths to the plate, much like a gate closes water off when the dam is low, allowing an additional charge to gather behind it, which return to their source. Then as the change takes place, the negative electrons again bombard the plate, being helped by a negative grid, which allows a stream of electrons to cross, carrying from the grid to the plate, which current actuates the phones, they being in the plate or high tension side of the circuit.

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directed to broadcasting, and has been made necessary by the crowding of the hitherto free and unoccupied air, which we call interference. By the allocation of wave lengths, the inspection of transmitting instruments and the attempt to induce better methods both mechanical and personnel, it is trying to minimize troubles so far as possible in the present state of the art.

Avoiding actual control and management, it has left the radio field free to individual research and personal initiative, adopting in this respect a policy unknown to most foreign countries where we frequently find direct management, close control, many restrictions and a strict system of taxes or fees imposed upon all stations and instruments whether for transmitting or receiving. We have chosen rather the minimum of intervention consistent with due regulation, coupled with full assistance in the working out of scientific problems. The government has enjoyed invaluable assistance from the persons directly interested, those who transmit and those who receive, and it appreciates the aid given it through the public conferences held under the auspices of the Secretary of Commerce, and the spirit with which all have joined in trying to solve common difficulties.

Rather than attempt to prophesy tonight, let us welcome this new station, a sturdy youngster, as it needs to be to hold its own with its broadcasting brethren; let us congratulate the men behind it upon the courage, enterprise and genius which have made it possible, and dedicate this latest example of modern magic to the dissemination of knowledge, to the increase of culture, to spiritual development, and to the spread of entertainment and happiness among the countless thousands who will hear its voice.

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A Card File for DX Reports

By Charles F. Filstead

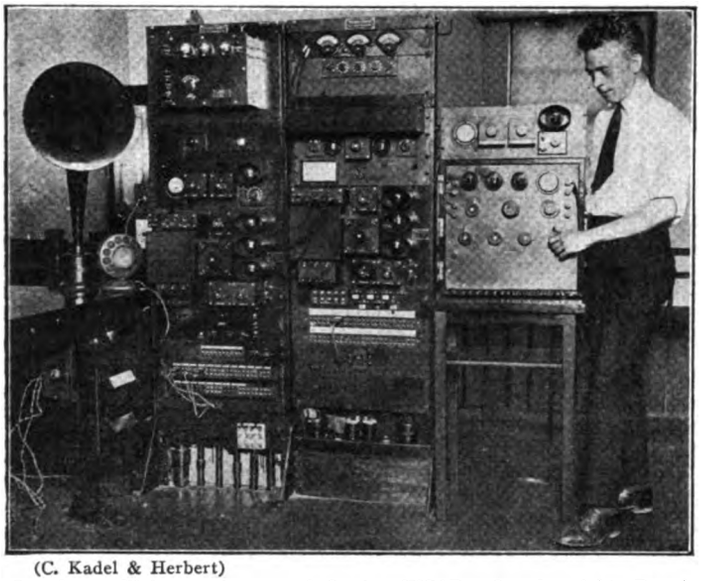
AMATEURS, as a rule, rate the efficiency of their transmitters by the number and distance of the cards they receive reporting their signals. They are perfectly right: there is no better way of determining the relative "getting-out" qualities of two individual transmitters than by comparing the number of distant stations that they have worked and who have reported them. Some amateurs even go so far as to tack up on the wall all the cards they receive, thus making the interior of their radio-room look very much like a futuristic artist's conception of the setting sun. To get away from this gaudy, patch-work effect, and at the same time have my cards where visitors could see them if they so desired, I arranged them alphabetically and according to districts in the form of a regular card catalog. The boxes used to hold the cards in standard card files are too small to hold post cards, so a special box must be constructed. This box may be made of almost any kind of wood, although quarter-inch thick oak or walnut, when properly stained, will probably make the best looking job. The inside dimensions of the box should be three inches high, eight inches long, and five and three-quarter inches wide. A box of this size will hold about 650 standard post cards together with the necessary index cards. The box can be held together with small nails or flat-head wood screws, and when finished, it can be stained and shellaced and, if desired, varnished.

There should be nine index cards, one for each district, and each one marked with a number from one to nine. In addition, there should be an index card marked "Foreign" and one marked "Canadian." If the builder has a great many Canadian reports, it would be best to have them also divided up into districts by index cards. All cards received from outside the United States—including boats at sea—should be grouped under "Foreign." The cards from each district should be placed in front of the index card bearing the number corresponding to that district. To make the finding of a card easy, it is well to arrange all the cards in each district alphabetically. If the amateur still wishes to adorn the wall, he can choose the best looking card from each district he has in Canada and the United States, and also one from each of his foreign countries, and tack them on the wall.

If he so wishes, the broadcast listener may start a "Stations Heard" file, in which he can place a card from each broadcasting station he hears. A good stack of cards from broadcasting stations acknowledging reports of hearing them would be a very good thing to rate the range of a receiving set by.

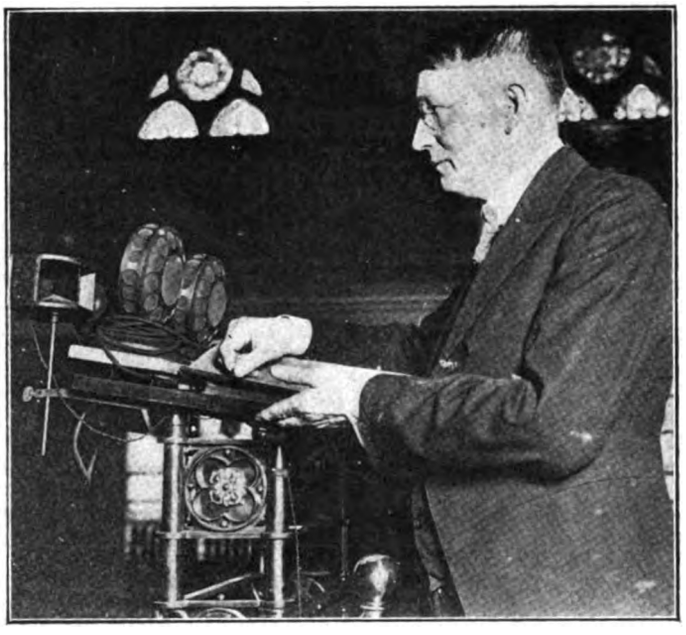
A large map should be used in conjunction with the card file herein described to show the location of the stations from which cards have been received. A map-tack should be put up for every broadcasting station you hear over a certain distance. The tacks representing the stations you have heard but once can be of one color, and the rest of a different color. These colored map-tacks can be bought at any stationery store. The map should have a cardboard backing heavy enough to hold the tacks and also to prevent them from marring the wall. Amateurs should have one color tack for the stations they have worked and another color tack for the stations that have heard them. To save tacks, it is well to mark stations only over a certain distance.

Harding Memorial Service Broadcast From Station WCAP



(C. Kadel & Herbert)

Speech amplifying equipment of Station WCAP. On the right, Dr. A. Freeman Anderson, who conducted the Harding memorial service at the late President's church in Washington, D. C.



It is estimated that over 1,500,000 radio listeners heard the memorial services held last week in Calvary Baptist Church, Washington, D. C. A close friend of the late President, Dr. A. Freeman Anderson, pastor of the church, delivered the sermon, which was broadcast through Stations WCAP, Washington, D. C., and WEAF, New York City. The services were relayed over special land lines from Washington and rebroadcast through the New York City station. Over half the United States was thus enabled to hear the services which otherwise only a few hundred would have been able to hear. Thousands of people journeyed from all over the country to be present at the funeral services of our late President, but those who could not were recompensed in the fact that they were present in spirit and heard the services as well as those who traveled.

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Keeping Down the Circuit Losses

By C. White, Consulting Engineer

THERE is nothing more important in building a radio outfit than the amount of losses in the wiring and the parts of the circuit. The best circuit ever devised will amount to nothing if care is not taken to see that excessive losses are avoided. Still if you should look in the back of some home-made sets and see the wiring behind the panel you would readily agree that the losses must be very high. It is a great regret perhaps that the regenerative receiver works when it is poorly constructed, thus allowing the careless constructor to get away without putting together a good job. A reflex circuit is not so gracious and will not function unless built properly, and this has been the reason why so many do not work at first.

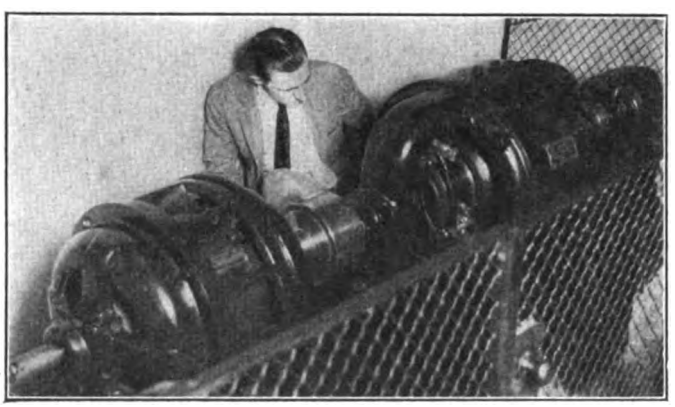
In building your set, first select good standard apparatus that is built right, regardless of the price, although cheap apparatus is not the same as inexpensive apparatus. The condenser, of course, can not be readily built in the home, hence care will have to be exercised in purchasing one. The plates of a good condenser should be of reasonably heavy gauge metal, evenly spaced, having the movable plates well insulated from the fixed plates. No iron or steel parts should be used in the construction. I always recommend that a condenser be mounted in a metal can, although it is to be used in back of a panel. This means that dirt will be kept out of the plates. You can not imagine just how much dirt can collect between the plates of a condenser, especially with those sets which are mounted on panels and have no cabinet. This dirt forms a rather good by-path for the radio-frequency currents and cuts down the effectiveness of the condenser to such an extent that sharp tuning will be impossible. A laboratory test was made on a condenser when new and another test after the condenser was allowed to sit out in the dust and dirt of the room for several weeks. The difference was most apparent.

The coils in the set are another source of losses. A coil should be wound on good insulating tubing, otherwise high losses are incurred. An ideal coil would be one that is wound with no insulating material, but this is mechanically impossible since the coil must be supported. Certain manufacturers of variometers and variocouplers have made use of this when winding their coils. Recently I made a frame just like the frame of a squirrel cage, or rotary rat cage. This form was made of good insulating material but only enough was used to support the coil. Then I wound No. 22 wire in and out of the rods in a manner resembling a basket weave, and, at the same time I kept the wires well spaced. The fact that the wires were kept well spaced and wound in a basket weave reduced the amount of distributed capacity, which meant sharper tuning and clearer signals; and the fact that as little insulating material as possible was used meant that the signal would be loud since the losses were low. If you are in an experimental frame of mind try the thing out and you will realize the difference it makes.

All connections should be made with bus bar wire, insulated with spaghetti tubing, and well soldered. If you use the type of solder wire that has an acid core take especial care to see that the acid does not spatter on to the panel and other parts of the set. This will cause howling and high losses, since the acid forms a good conducting path. The best way to avoid this is to put the solder on the iron first and then apply to the part to be soldered. A bad method is to place the iron, the solder wire and the part together, which will always result in the spatter of the acid on to other parts of the set. If you use resin flux solder be sure not to get resin all over the apparatus used for a similar reason. Keep all wires as short as possible and yet retain a neat wiring appearance. The latter means a lot when you are endeavoring to trace out trouble or to make some change in the connections. Mistakes are not so liable when everything is kept clean and clear, just the same as in bookkeeping. Blow dirt and dust out of your set when you have finished wiring. A little lump of solder or dirt can cause a lot of trouble.

Shielding is always advisable, but, it can like anything else, be carried to excess. I have seen sets that have entirely too much shielding which detracts from signal strength, since it always causes losses. If you can, do without shielding. This is the reason some manufacturers do as little shielding as possible, just placing a little grounded copper foil in the vicinity of a condenser or variometer. All the rules given in this article seem obvious, but you would be surprised to know that 80 per cent. of the troubles my friends have had because signals did not come through as loud as they should was to be found in one of the rules which they have disregarded in constructing their receiver . The old saying is "Haste makes waste," and it certainly is true with the amateur who tries to build his receiver in a minute.

Station WJAZ Has 10kw Generator



(C. Underwood & Underwood)

The Zenith Edgewater Beach Station WJAZ at Chicago includes in its plant a 4,000-volt motor-generator illustrated above. It is this station which is expected to pick up messages from Capt. Donald MacMillan's arctic exploration vessel "Bowdoin," now far north of Labrador.

Do You Realize It?

IT is always a good plan to find out what wire you are crossing or going under when erecting your antenna. It only takes a few hours to make all the inquiries and look around, and you will not be taking a chance of getting killed or injured. Many a man has lost his life or been injured by running wires across high tension or power lines, and having them cross during a high wind or storm.

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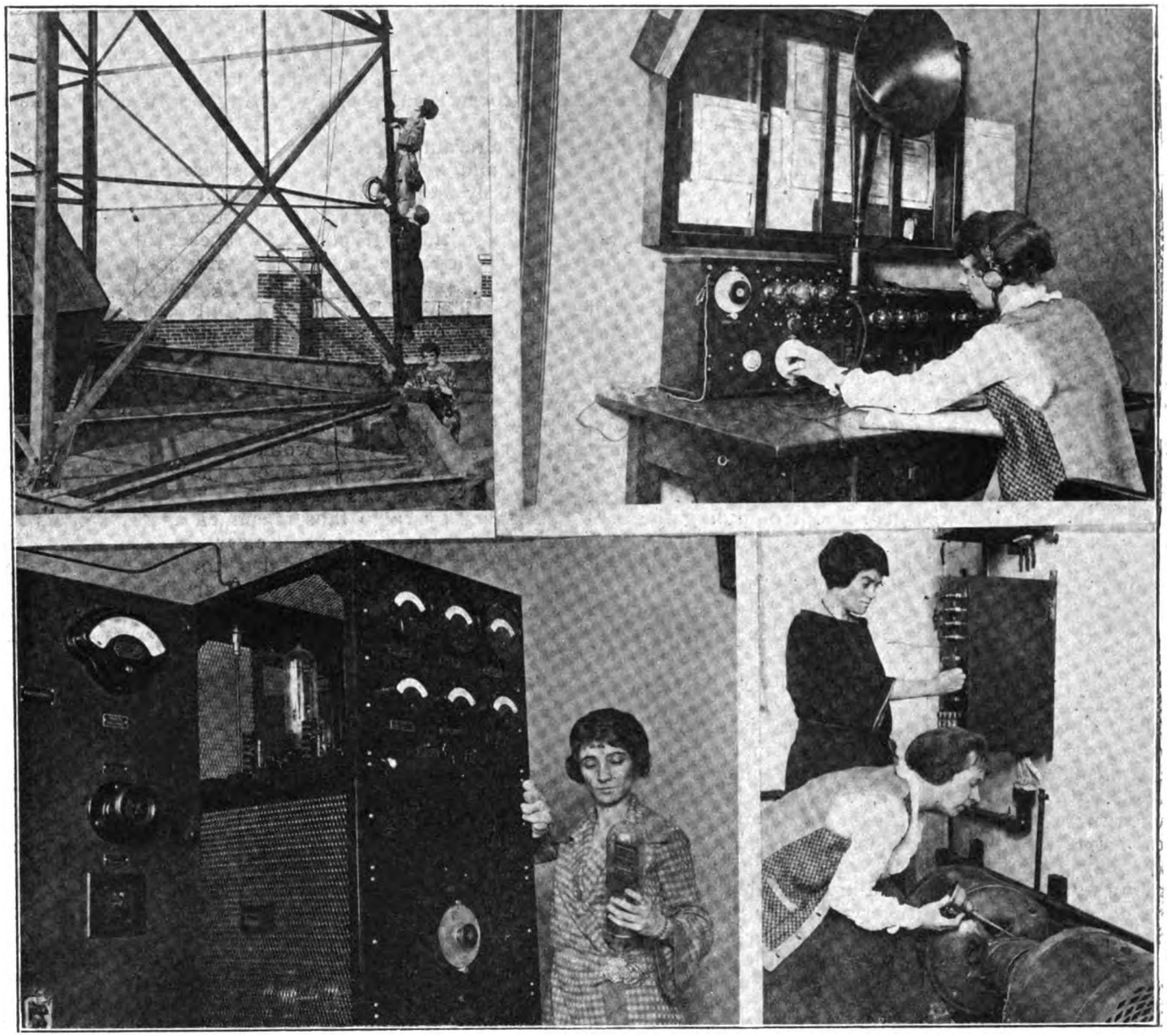
Women Operate a Broadcasting Station



(C. Kadel and Herbert)

For the first time in the history of broadcasting women entirely replaced men temporarily in the operation of a station. Station WEAF, of the American Telephone and Telegraph Company, New York City, was run recently by girls recruited from the regular forces. The upper left hand picture shows Miss Alice Hunt and Miss Elsie Schneeweiss hunting for a leaky insulator up the tall steel mast, while Natalie Connor is checking the wave length from below. Directly next to this picture is Miss Schneeweiss supervising the transmission and keeping a lookout for SOS calls on commercial ship wave lengths. Below is Miss Alice Hunt standing next to the transmitter examining a 250-watt tube. On the lower right is seen Miss Elsie L. Schneeweiss and Miss Natalie Conner oiling the generators and checking up before putting them into service for the day's broadcasting work. Now, who said "A man's a man for a' o' that." It seems that when they get right down to it the so-called weaker sex can give just as good broadcasting service as any man ever did.

Cures for Distortion of Radio Signals

By R. L. Dougherty

MANY operators of receivers, especially the single circuit type, are troubled with the distortion of signals. This makes itself noticeable in mushy signals and indistinguishable speech and music. In extreme cases it is only noticed in the pronounced overtones or undertones, the middle tones being clear.

There are many causes of distored signals and a discussion of them and their control will no doubt be of benefit to the average fan not well versed in the extreme technical properties of his receiver.

The most common cause of distortion lies in supplying the filament with too much current. This causes the tube to oscillate violently, causing what is known as "beats." It is noticed when the set is slightly detuned from a station by a pronounced howl. Of course, the remedy for it is to turn down the rheostat until the signals can be heard clear. To test whether you are getting the proper filament voltage, it is only necessary to detune your receiver on either side of the peak, and if quiet but much lessened signals are heard, your filament voltage is correct. In the reception of distant signals an operator will often deem it necessary

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(*Concluded from preceding page*)

to tune for the station by this "beat" method, but after the station is once located, the filament should be turned down. In single circuits this slight decrease of filament current will ofttimes cause the signals to come in much louder than when the receiver is oscillating violently. With the dry cell tubes it is very hard to control the tube to such action, so a vernier control for the rheostat is advisable, as you will then be able to make the tube work just before it "spills" and starts to oscillate.

Another cause of distorted signals is an improper grid leak. The grid of the tube playing the active part it does in the reception of signals, must have the correct amount of capacity and leak in the circuit. If too little grid leak resistance is introduced, it will carry off an excessive amount of the minute energy, and the signals will be mushy or weak. Sometimes this condition makes itself known by a constant clicking, which will increase as the capacity is reduced, or decrease as the capacity is increased, and will finally disappear and the tube will have a hollow sound. This is the proper capacity for correct operation. If too much grid leak capacity is introduced the signals will be distorted due to the fact that the grid is not obtaining the correct amount of negative electrons through it, and therefore is overcharged and cannot release quick enough for proper operation. When this condition is present, a thick muffly choked signal will be noticed, and the tube will not show a tendency to oscillate freely when the set is tuned. Reduce the capacity to the point where the speech is absolutely clear and undistorted.

Too much capacity in the grid circuit is another cause of distortion. This is noted as a spasmodic clearing of signals whenever the grid circuit is touched with the hand, and a pronounced body capacity effect in the set when tuning. Too little capacity will cause the signals to be extremely sharp toned in quality, the speech resembling a man with an unpleasant voice with a cold, trying to make himself heard in a crowded hall. Tubes are designed for use with certain capacities in the grid circuit, and if the correct capacity does not seem to produce results, a three-plate variable condenser in parallel with the fixed condenser will soon clear it up if too little capacity is noted, and a smaller fixed condenser in the circuit instead of the one used will clear it up if too much capacity is noted.

Excessive B battery voltage is ofttimes a cause of distortion of signals. Radio fans have found out that if the B battery voltage in a circuit is increased, the volume will increase in a like manner. But they do not take into consideration that the smaller tubes can be "overloaded." In the detector tube, especially if it is one of the dry cell type, a certain voltage is specified by the manufacturer. Fans have found out that they cannot damage their tubes if more than the specified amount is placed in the circuit and they accordingly use a greater voltage than the tube can stand. If distortion is noticed and you are using more than the specified amount of current in the plate circuit you can easily determine by shifting the voltage whether this is the cause of the distortion. It sometimes is best to even use less than the specified amount, if clear signals are desired.

Another cause of distortion in radio sets is noticed when too many sets of phones of different types are connected in the circuit. This is because the phones do not all have the same resistance characteristics, and one pair is not functioning properly. If one pair rattles when more than a single set of phones are in the circuit the entire set of phones connected in the circuit will rattle. Test them out separately and discard the set that is causing the disturbance. In the same manner distortion is ofttimes caused by not having enough resistance in the phone circuit. Frequently a set will bring in much clearer signals when two sets of phones are connected in series than when the two are connected in the circuit in parallel. The test for this, of course, lies in connecting the two sets of phones in the correct manner, by testing out which works the best.

Where amplifiers are used, distortion is very noticeable, and is sometimes almost impossible to correct. The only method of overcoming it lies in the use of the proper transformers, and the use of power tubes as amplifier tubes if possible. These tubes, strange to say, will operate in an amplifying set with wonderful clearness, all other things being equal, and will stand excessive plate current without causing distortion. For instance, the popular five watt tubes can be operated with 190 volts on the plate and sometimes even up to 350 without very noticeable distortion of signals. Were this attempted with the regulation amplifier tubes it is probable that the distortion would be so great that the signals would become a jumble of horrible noises, which would not resemble the voice at all.

Lately there has been quite a bit of trouble experienced by radio fans inasmuch as the signals from one station will be crystal clear, and the signals from another will be mushy and distorted. If you receive signals from the greater number of stations clearly, and a single station is mushy, you do not need to look to your receiver for trouble as it is the modulation of the transmitting station that is at fault.

Probably the most common form of distorted signals results from "forcing" your regenerative sets. This is caused by too close coupling when operating the set just below the "spill over" point. Regeneration can be carried on in a set up to a certain point, and wonderfully loud signals will be the answer, but carry the regeneration or feedback just a little bit too far, and the advantage is lost, for then your receiver becomes a violent producer of oscillations, and you will wake the neighborhood by an overproduction of "birdies" which will cause people to swear and will not get you anything. The obvious thing to do in that case is to reduce your regeneration control to a finer point.

Another method of clearing up distorted signals can be had by the use of a small capacity condenser across the phone terminals. This will ofttimes clear up a signal when all else has failed, provided, of course, that the distortion does not have its origin in one of the other causes.

Teaching Radio in Sleep Proves Success

FURTHER reports from the Naval Air Station at Pensacola, Fla., on the success attained in teaching radio code to student aviators in their sleep shows progress in this novel and useful experiment. The experimental stage in the trials has been passed and the method has become standard as a means of saving students from failure.

When the test was started 12 students were unsatisfactory in their progress in radio code. After two nights, during which radio code was sent to the students in their sleep, only two of the students were unsatisfactory, and these two men left before the experiment was finished, professing disbelief in it.

The procedure has been to have the students sleep on the tables in the radio room where the code is taught in the regular school periods. Operators send messages at varying speeds all night.

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

One firm in the United States turns out 7,500,000 feet of stranded aerial wire a month.

* * *

The First National Bank of Whitehouse, N. J., as an experiment installed a radio receiving set with a loud speaker in its women's banking department. On "radio days" the First National's receiving teller is now kept busy opening new accounts.

* * *

A small radio receiving set has been installed at every bedside in Beth Israel Hospital, New York City. The superintendent hopes the device will lighten the patients' sufferings by turning their minds from their own discomfort and loneliness to concerts, lectures and news reports.

* * *

The one medium in existence today which has the greatest possibilities for creating a love and an appreciation of beautiful music in the American home, is the broadcasting station. It is safe to say that every earnest program director of radio broadcasting in the world is endeavoring to provide for the public a menu of the best musical food.—*Fred Smith, Studio Director Station WLW.*

* * *

Thomas A. Edison and Mrs. Edison left West Orange, N. J., last week for a month's automobile trip through the Middle West with Mr. and Mrs. Henry Firestone, of Akron, O., and Mr. and Mrs. Henry Ford. The party will travel through the Northern Michigan Peninsula and the Eagle River district of Wisconsin. At some place in Michigan or Wisconsin they will camp two weeks. Mr. Edison expects to return about September 1.

* * *

Silver champagne buckets were put to a use which is a commentary on the times at a "good will luncheon" given by the United States Lines aboard the "Leviathan" in her dock at Southampton, England. These receptacles, once a necessary part of a ship's dining service, were inverted on the tables and on them were placed the loud speakers of a voice amplifying system installed to make the speeches audible to everyone of the 500 guests present.

* * *

The U. S. S. "Pittsburgh" operating in the Mediterranean Sea states in an official report that the Radio Station at Poitiers, France, was communicated with on 3,350 meters CW using a 20 KW arc with 45 to 50 amperes radiation The greatest distance traversed by the radio dispatches was approximately 1,800 miles, while the "Pittsburgh" was at Alexandria, Egypt. Poitiers reported that all signals were good in the evening, being heard through heavy static interference.

* * *

The Supervisor of Radio for Atlanta, Ga.—Walter Van Nostrand, Jr.—will open his office in the Federal Building soon, it was announced at the Department of Commerce last week. Orders directing him to proceed from his old station at Norfolk have been issued, and he was expected to leave for Atlanta immediately.

* * *

Major Edw. H. Armstrong, to whom was granted Patent No. 1,113,149 for the regenerative circuit, one of the most valuable in the radio industry, had a tough time to get started. After he had made his invention he asked his father and his uncle for money to secure a patent and both refused. However, he had his drawings witnessed before a notary and thereby recorded his discovery. He filed an application for a patent on October 29, 1913, which was granted on October 6, 1914. In spite of numerous attacks the courts have sustained and protected Major Armstrong's patent in every instance. The invention was made while he was a student at Columbia University, New York City.

Los Angeles Mayor Awards Radio Medals

(C. Keystone View Co.)

The first radio operators to receive decorations for meritorious service in time of extreme peril were the three on the S. S. "City of Honolulu," which burned and sank in mid-Pacific. The Radio Corporation of America donated the medals which were presented to the operators by Mayor George C. Cryer, of Los Angeles, Cal. The picture shows the mayor at the extreme left congratulating them. Left to right they are Mayor Cryer, N. C. Kuller, third operator; Walter P. Bell, chief operator, and H. D. Hancock, second operator. The Mayor's secretary on the extreme right.

The "Wouff-Hongs" Will Be at the Chicago Convention

CHICAGO, ILL.—Initiation of candidates into the Royal Order of the "Wouff-Hong" will be one of the principal features on the last evening "night of mystery" at the Second National American Radio Relay League Convention which is to be held here September 12-15 under the auspices of the Chicago Radio Traffic Association. Convention headquarters will be the Edgewater Beach Hotel.

The order of the mysterious "Wouff-Hong" has become an institution in amateur radio and its membership is spreading rapidly over the entire country wherever there are radio men. The word is believed to have originated with the "Old Man," for years a contributor to the amateur magazine "QST," but whose real identity and general status in amateur radio has never been revealed.

One story has it that the "Wouff-Hong" is an instrument used to eliminate interference by annihilation of those who are over zealous in their use of the ether. What is reputed to be an exact replica of this "deadly" weapon, somewhat resembling in its construction an Indian tomahawk, actually exists.

As a secret order the "Wouff-Hong" had its beginning at an amateur convention in Flint, Michigan, at which time several hundred candidates were initiated. Interest developed to such an extent that another meeting was staged at an Ohio convention.

Through the traffic system of the American Radio Relay League the fame of the order has been spread far and wide, with the result that a constitution and ritual may be adopted formally in Chicago and the "Wouff-Hong" will hold henceforth a unique place in amateur radio affairs.

Latest developments in amateur and broadcast reception and transmission will be covered by speakers of national reputation, according to R. H. G. Mathews, central division manager of the league, and committeemen in charge of the convention program.

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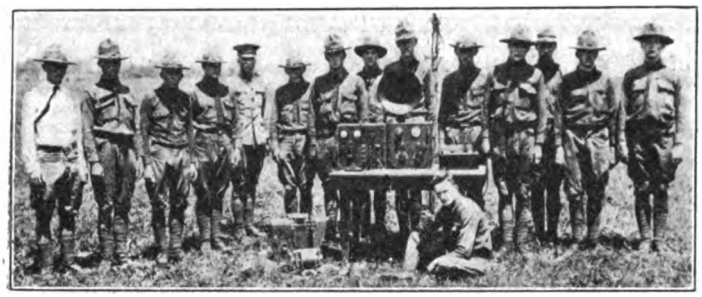
A Round Dozen Sparkling an



(C. Underwood and Underwood)

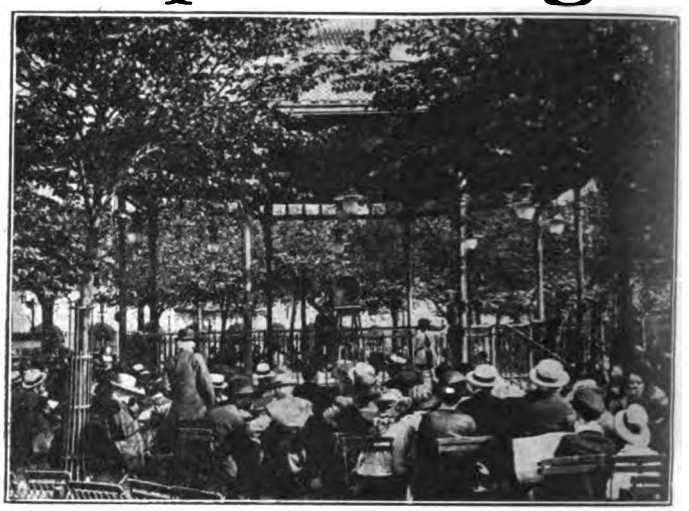
Reserve officers of the Signal School, Camp Alfred Vail, New Jersey, who are learning to become radio operators, listening to a Sunday afternoon concert while off duty. All these men are given a thorough course in the operation, maintenance and theory of radio. Because of their training the United States Army has the best radio and telegraph operators.

(C. Underwood and Underwood)

Another interesting branch of communication work taken up by the Signal Reserve Officers Training Corps School, at Camp Vail, is the field telephone. Here the men learn all the ins and outs of installing and operating a regulation army field telephone set. The conditions these men work under during practice and war-time are strenuous and severe.

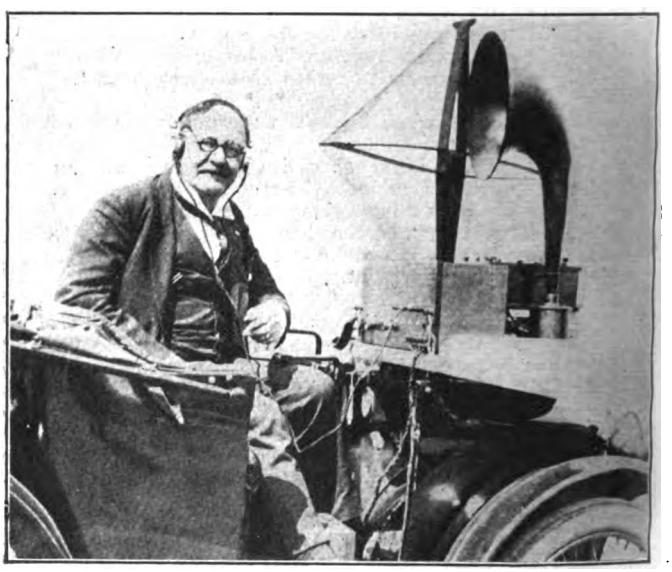
(C. Kadel and Herbert)

Miss Pearl Eaton and Miss Lois Wilde are the proud possessors of a full-fledged radio set, and being kind-hearted, like to let the neighbors in on what's what. So they set the loud speaker out the window, and give everybody a chance to hear the concerts.



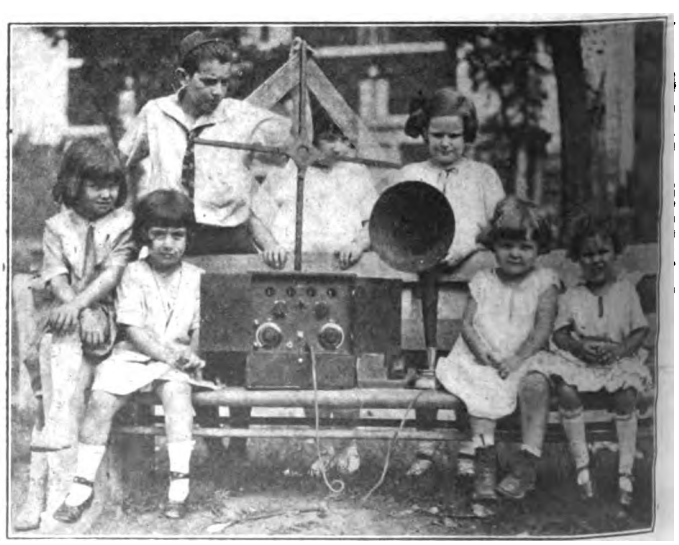
(C. Kadel and Herbert)

Broadcasting de luxe. Here is the manner in which they broadcast popular concerts in Paris, France. The old bandstand on the Champs Elysees no longer holds the proud bandmaster and his band of trusty musicians. Instead it has been replaced by the efficient loud speaker and radio set.



(C. International Newsreel)

Colonel E. H. R. Green, the well-known millionaire radio fan and experimenter, touring the country near his home in his new electric runabout which is equipped with a seven-tube receiver. He ofttimes goes on short trips of this sort to determine just how his broadcasting station, located on his vast estate near South Dartmouth, Mass., is working.



(C. Kadel and Herbert)

Here is one young man who realizes that every one hasn't the good fortune to own a radio set. Master Edmund Keene, who is the proud possessor of a De Forest reflex, thinks that other people can also get some fun out of it, so he takes it to Central Park, New York City, and lets the mothers and their kiddies enjoy a concert every afternoon.

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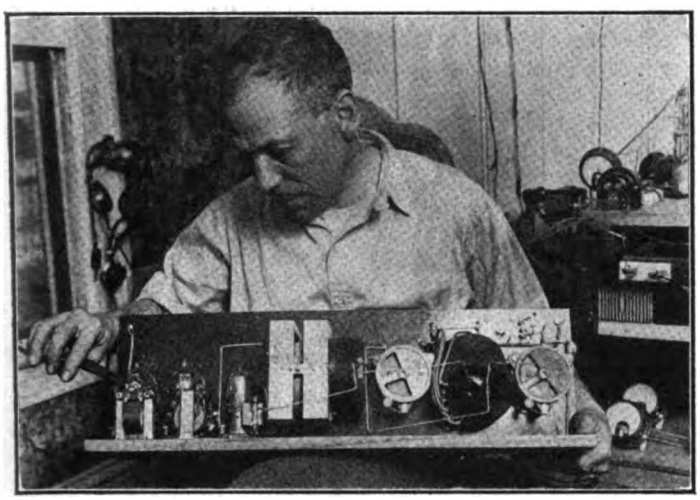
d Interesting Radio Pictures

(C. Acme Service)

Class in radio at Hunter College, New York City, mastering the principles of induction. Dr. A. Turner explaining the action of an immense spark coil, operating from a six-volt storage battery, to a class of women students who are taking a course in radio. Radio is fast becoming a popular course in all colleges, both for men and women, and the interest taken is largely attributed to the popularity of broadcasting and the innate curiosity of human beings to know "what makes the wheels go round." Many women have applied for courses which when completed will entitle them to sign their names as R. E., or radio engineers.



(C. Kadel and Herbert)

Leo Johnson, better known as Radio 2CTQ, finishing up his newest three-circuit receiver, which he especially designed to be super-selective. Of special note to builders is the fact that the constructor has left plenty of space for every instrument, crowding nothing. This, and the use of the best instruments, is the only method by which receivers can be constructed for selectivity. Note also that five-watt tubes are used as amplifiers.

(C. Kadel and Herbert)

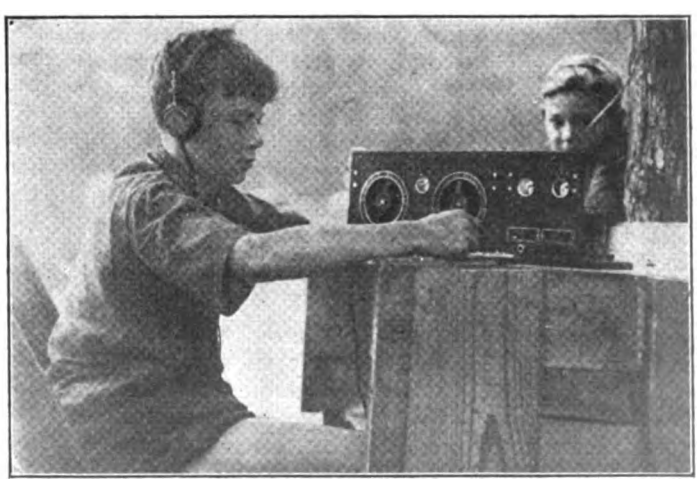
During the recent warm spell Peggy Joyce had a date to broadcast a speech. As the studio proved entirely too uncomfortable to talk in (it really is, closed in as it is by heavy draperies to prevent noises) she suggested that they run the wires for the microphone out to her Rolls Royce, where she gave her talk in comfort.

(C. International Newsreel)

Caesar and Buddy, two canine radio hounds, listening to a vocal solo. Evidently Caesar does not appreciate the ladies' efforts to please, by the cynical expression on his face, while Buddy is laughing right out loud. Well, we can't please everybody.

(C. Kadel and Herbert)

Radio plays an important part in the destruction of airplanes these days. During a recent anti-aircraft practice shoot at Fort Tilden, New York, the boats were constantly informed of the activities of the scout planes, and nearly 100% hits were recorded as a result. The illustration shows two scout officers signaling the boats as to the position of two of the "enemy" planes.



(C. Underwood and Underwood)

Two lucky scouts at Camp Kanohwahke, Interstate Park, N. J., listening in. It will be of interest to radio fans to know that at the present time there is not a single scout outfit in the United States that does not possess at least a radio receiver, while many of them even boast licensed transmitting stations, which the scouts operate.

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A "Neutro-Generative" Receiver

By C. White, Consulting Engineer

RADIO-FREQUENCY amplification and regenerative receivers have had one common fault—the tendency to oscillate. With the latter it has been possible to exert very good control over this tendency by the proper construction of the working parts and the correct amount of control. In fact, some regenerative receivers have such a fine degree of control that it is easily possible to tune in distant stations without allowing the tube to oscillate in order to get the carrier wave whistle by the zero beat note method. The very function of regeneration is holding the detector tube on the verge of oscillation, but not allowing it to "spill over." But radio-frequency amplification is amplifying the radio-frequency carrier wave before detection, and does not in any way depend upon holding the tube or tubes on the verge of oscillation as in the case of regeneration. Yet it is often true that

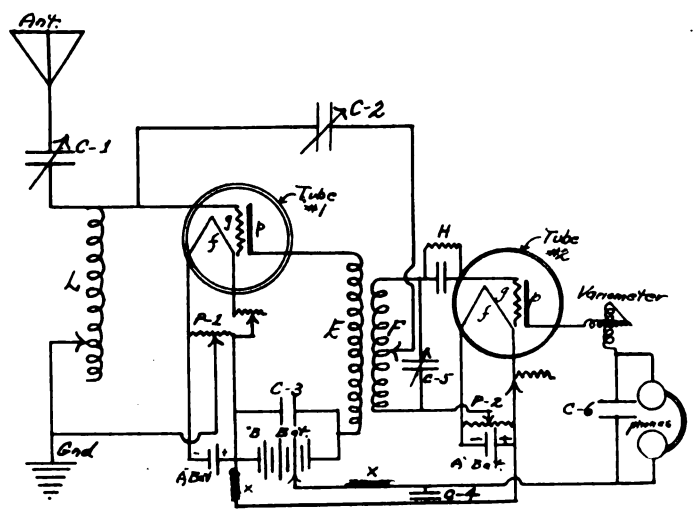

Diagram of a two-tube receiver that embodies several excellent features. It is a radio-frequency amplifier, which is regenerative, and at the same time will not oscillate violently beyond the "spill over" point due to the neutrodyne principle that is employed. It is simple to construct, requiring the construction and winding of but three coils, two of which are tapped. Audio-frequency amplification can be added, but, as shown in the diagram, separate batteries should be used for that purpose. Sufficiently loud signals will be possible with this receiver if headphones are wanted, and the clearness and quietness of operation will satisfy the most critical.

when a tube is on the best part of its radio-frequency amplifying characteristic it is very apt to "spill over" and spoil the amplification. To prevent this spilling over or oscillating various methods or dodges have been resorted to. One common method is the insertion of a resistance by means of a potentiometer in the filament-grid circuit of the amplifier tube which produces no serious harm when the tube is amplifying but introduces high losses if the tube tends to spill over or oscillate. It acts as a check on the tube action. But lately another method of prevention has been used, namely, the "neutrodyne" method, wherein the capacity of the tube element is balanced or neutralized by a condenser of very small capacity.

I shall not endeavor to go into the discussion of the merits of various methods, but only to say that the receiver here outlined combines in some respects the essential parts of each of the three systems. Of course, if it is desired to economize and cut down the number of controls the two potentiometers P-1 and P-2, in the diagram herewith, can be omitted and the grid returns of the tubes No. 1 and No. 2 can be connected to their respective negative sides of the "A" battery. Still, I think that the presence of these controls affords a control of volume as well as quality and are well worth their trouble and expense. The inductance coil L is wound on 4" tubing, having 60 turns in all of No. 22 S. C. C. magnet wire tapped at every tenth turn for a switch point. The coil F is constructed in the same identical manner, while the coil E is wound on 3½" tubing with 60 turns of No. 22 S. C. C. untapped. The coil E is placed inside of the coil F, and the overall length of the unit L and the unit E-F will not exceed 3½" apiece. The condensers are as follows: C-1 23 plates with vernier attachment; C-2, a very small two plate vernier condenser; C-3, a .5 mfd. condenser; C-4, the same as C-3; C-5, an 11 or 13 plate condenser with vernier attachment; and C-6, a .002 mfd. phone by-pass condenser. The manner in which these condensers are actually connected in the circuit will certainly make a lot of difference, so I advise a close following of these instructions. The condenser C-1 has the movable plates connected to the Ant., C-2 has the fixed plates connected to the grid of tube No. 1 and the movable to the switch-arm on coil F, while C-5 has the fixed plates nearest the grid of tube No. 2.

It is of the utmost importance to carefully shield this set with copper foil so as to prevent howling and annoying body capacity. The choke coils X have an inductance of .1 henry and are iron core chokes. This set is designed to operate with the new UV199, hence two separate "A" batteries are recommended. These batteries can be of the flashlight size since these tubes draw very little current, above .06 ampere. The grid leak H to be used with the UV199 or C299 should be variable from two to five megohms and a grid condenser of .00025 mfd. is advised. The filament rheostats should have a resistance of about 30 ohms apiece. The potentiometers P-1 and P-2 should have a resistance of 400 ohms apiece and be non-inductive. Any good variometer will do as a plate inductance on tube No. 2.

This receiver operates best with a very short aerial and is far more selective and clearer than when a long outdoor aerial is used. Tuning a station is in control of the inductance taps on L, the condenser C-1, and the condenser C-5. The variometer controls the volume to a certain extent. The taps on the coil F and the condenser C-2 should be adjusted so as to prevent oscillation at all wave length ranges of the receiver. If this is not possible with your particular receiver then the wave length bands will have to be grouped and a setting for each group will correspond to a definite calibration on C-2 and F. After C-2 and the taps of F have been ascertained there is no more guess work or further adjustment necessary. The set is very flexible and it will be soon discovered that several good adjustments can be made for each station, but there is always one that gives the best results. When properly built the receiver is very efficient, but care must be exercised to see that it is properly constructed. Grid leads must be kept as short as possible, and all wires should be well insulated with spaghetti. Audio-frequency amplification can be used with this receiver. It will be found advisable to use separate "A" and "B" batteries for the amplifier, however, in order to keep the outfit quiet working. Since UV199 tubes are used the extra expense is not very heavy and the results produced certainly warrant it.

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Latest Radio Patents

Method of Sensitizing the Telegraphone

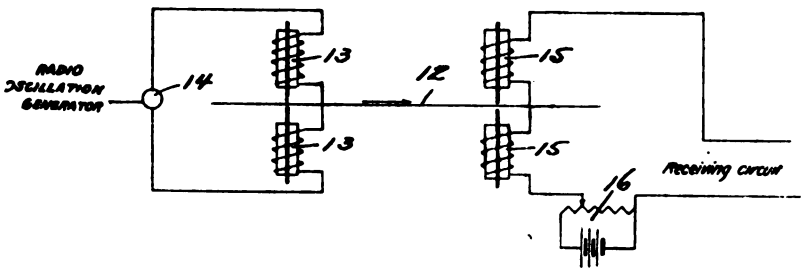
No. 1,450,282: Patented June 19, 1923. Patentee: L. F. Fuller, Palo Alto, Cal.

The telegraphone, as is well known, comprises an instrument in which a magnetizable wire or surface is locally magnetized in varying degrees at successive points along the wire or surface and at this spot magnetization persists, so that a record is produced on the wire or surface which may be subsequently reproduced. An object of this invention is to sensitize the telegraphone so that it will record magnetically on its wire very much weaker electrical impulses transmitted to its magnetizing coils than is at present possible.

The invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown two forms of apparatus for carrying out the method of my invention, but it is to be understood that I do not limit myself to such forms, since the method may be performed with other forms of apparatus.

An object of the invention is to sensitize the telegraphone so that it may be used for high speed radio signal recording, submarine cable signal recording, long distance telephone message recording and the recording of other weak electrical impulses.

Attempts have been made in the past to use the telegraphone for high speed receiving, but these attempts have been mostly unsuccessful, due to the insensitiveness of the telegraphone, which required abnormally strong signals to cause a record on the telegraphone wire.



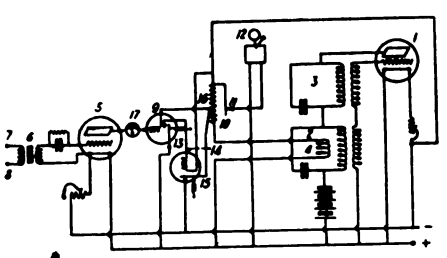
Method used to sensitize the movable recording wire of a telegraphone making it sensitive to much weaker impulses than is now possible. It is applicable to radio recording devices.

Receiving System

No. 1,462,882: Patented July 24, 1923. Patentee: Henri Chereix, Paris, France.

The present invention relates to improvements in relays of the kind described in my copending applications Serial Nos. 496,667 and 496,668, filed August 29, 1921, and more particularly to an improved adaptation of the said relay for automatic calling arrangements in wireless telegraphy or telephony.

Generally speaking, the improvement effected by the present invention consists in the following: a vibrator system and a thermostat associated therewith for actuating a call indicating apparatus such as a bell is carried back to the circuit of the element that controls the oscillating conditions (comprising a three electrode tube arranged as a detector in accordance with the previous applications). The vibrator system is preferably arranged in a special manner by the combination of the two electro-magnetic relays.



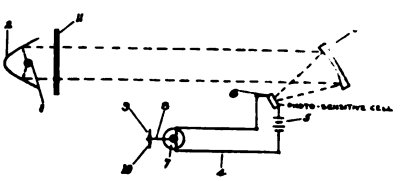
Means of providing an electrical call system that may be actuated by means of radio. Electronic relays are used in connection with tuned circuits specially designed to operate magnetic relays upon reception of certain waves.

* * *

System of Electrical Control

No. 1,458,165: Patented June 12, 1923. Patentee: W. W. Coblentz, Washington, D. C.

This invention has reference to improvements in a system of electrical control, having for its object to provide a novel apparatus and method of thermal radio dynamic control of mechanisms whereby to render possible the remote control of various mechanisms possible and practical through the use of light reactive material interposed in the control circuit and adapted, with the projection of certain colors of light rays from a point distant thereonto, to have its electrical conductivity either increased or decreased whereby to vary the passage of current through the circuit and to bring about the desired operation.



Improved method of controlling electrical circuits by means of beams of colored light projected to affect photo-sensitive cells, which in turn actuate sensitive magnetic relays.

Antenna Selector Switch

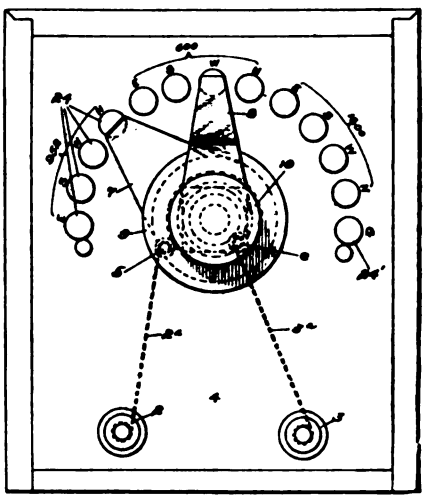
No. 1,456,466: Patented June 12, 1923. Patentee: Alfred Crossley, Washington, D. C.

My invention relates broadly to underground radio receiving systems and more particularly to a switching device for use as a selector to connect various combinations of antennae to the radio receiving apparatus for directive reception.

The object of my invention is to provide a practical selector switch capable of rapid manipulation to connect various combinations of underground, elevated or loop antennae to the receiving apparatus.

Another object of the invention is to provide in an antenna switch construction means for insuring perfect electrical contact of the switch elements.

My invention will be understood by reference to the accompanying drawings which form a part of this specification and in which like reference characters have been used to indicate like parts throughout the several views.



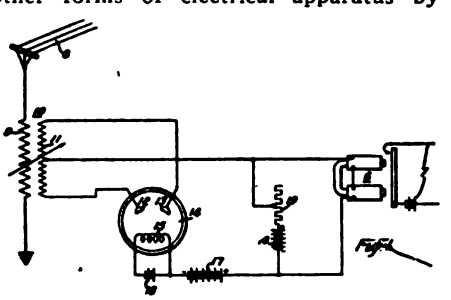
Apparatus and means for rapidly switching receiving apparatus from one antenna system to another. This method is especially applicable to underground antenna systems, which possess marked directional effects, thereby giving a great degree of selectivity.

* * *

Receiver for Wireless Impulses

No. 1,456,567: Patented May 29, 1923. Patentee: Frank Conrad, Pittsburgh, Pa.

This invention relates to apparatus for the receipt of wireless impulses and it has for its object to provide apparatus of the character designated that shall enable one to distantly control relays or other forms of electrical apparatus by means of wireless impulses and, at the same time, to substantially prevent the operation of such apparatus by other than the impulses intended therefor. The accompanying drawing is a diagrammatic view of a system embodying the invention, being shown for the wireless control of a distant relay.



Means of actuating a relay by other vibrations. The apparatus can be used to control machinery at a distance and to control any electrical circuit from the same point.

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Answers to Readers of Radio World

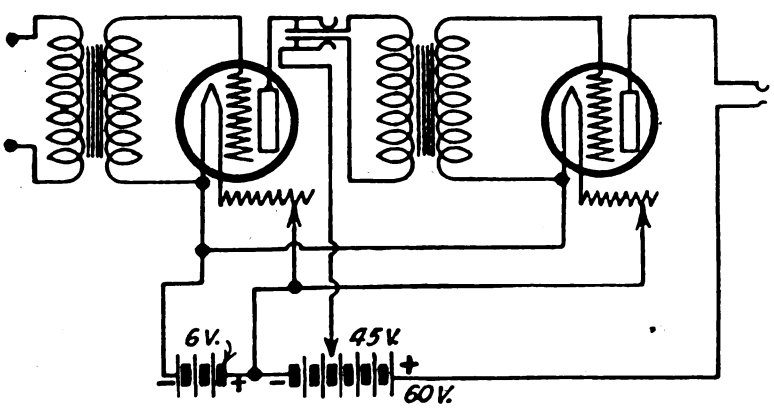
In RADIO WORLD, *July 7, you published a Lighthouse Receiver. What size wire is used on the coils, and what size are the former? Also what size variable condenser is used?—W. K. McClain, Lawrence, Kans.*

For the coils mentioned No. 26 SCC wire is sufficient. The former should be cut out of fibre or heavy cardboard, and should be four inches outside diameter with a core one inch across. The number of turns is shown in the diagram. A .0005 variable condenser is sufficient.

* * *

Enclosed find a circuit published in RADIO WORLD, *June 23, by A. D. Turnbull. Kindly give me a correct hook-up to use with it. Where should I tap the variometer? Which is the positive side of the B battery? Kindly give me a two-stage amplifying circuit for use with this circuit.—Y. T. Harvey, New York City.*

Your question is vague. The hook-up as you show it and as it is in the magazine are identical, and both are correct. If you mean a panel layout for such a set, we do not handle them, as we leave the design of the set up to the builder. The variometer is tapped at the connection of the stator and rotor, which is generally made by means of the shafting that runs through the rotor. The amplifying circuit you mention is printed herewith.



Schematic diagram of a suitable two-stage amplifier asked for by Y. T. Harvey, New York. The circuit is shown using separate A and B batteries from the detector circuit. This prevents any chance of feedback through the battery leads from the detector.

* * *

Is the Grimes inverse duplex circuit superior to the De Forest reflex as used in the D7 receiver? I intend using Acme A2 transformers, and Acme radio-frequency transformers. Which type do you recommend as being the best? Could I use an outside antenna and variocoupler as tuner instead of the loop as described?—Teddy Kuss, Pine City, Minn.

We cannot discuss the relative capabilities of the various circuits in comparison with manufactured apparatus. However, you will not make any mistake in constructing the circuit you mention if great care is taken. In reflex circuits the greatest care must be observed in wiring, as well as in the selection of the parts.

You can use the type of radio-frequency transformers you mention. The numbers they go by signify the wave length that they are supposed to tune to. Therefore determine beforehand just what wave length you wish to receive over and buy your transformers accordingly.

You can use a coupler and antenna and ground by simply connecting them across the terminals of the condenser that shunt the loop. Numerous articles have appeared in RADIO WORLD showing tuning units that can easily be constructed for this purpose.

* * *

I have built a two tube reflex, with crystal detector, according to diagram enclosed. My trouble lies in getting any distant stations, and also in keeping them after I once get them. They just seem to fade out, and I cannot get them any more. The entire set oscillates very easily; as a matter of fact, I cannot stop it from oscillating. My apparatus is all the best make and has worked in a one tube reflex successfully.—Wayne H. Merrick, Caldwell, Idaho.

Your diagram for a two tube reflex set is absolutely correct, and is the ordinary two tube reflex circuit using crystal detector. The fact that your set is oscillating is due to inter-coupling between the transformers. Separate them by a sufficient distance and if possible have their cores at right angles to one another. Shielding your panel carefully might help the fading of stations after you have them tuned in. Do not run your leads parallel to one another for too great a distance and use varnished cambric tubing to insulate them.

* * *

Do W. D. 12 tubes require a different hook-up than that used by the regular six volt tubes? I am using three of these tubes as radio-frequency amplifiers but cannot seem to get the third stage to work successfully.—John Gallub, Box 65, Chatham, N. Y.

These tubes do not require a special circuit. Examine the transformer of your third stage. Your trouble may lie in the fact that you have a defective transformer, which is the only thing that would cause your trouble if your set is correctly wired.

* * *

I have constructed the Cockaday circuit described by R. P. May in RADIO WORLD. *It works fine, but I am puzzled as to the need of the switch S in the drawing. I have left it at the place shown in the drawing but it does not seem to be necessary. When should I use it?—F. W. Kerchner, Glen Corbon, Ill.*

In the tuning in of distant stations it is sometimes necessary to use this switch. It has a neutralizing effect on the third tube and allows finer tuning by allowing a bias to be placed on the grid, or to allow a certain capacity feedback on the third tube, which will help in certain cases. You must experiment in each case and find out just which works best.

* * *

I am enclosing a circuit diagram using one stage of radio-frequency, detector and two stages of audio-frequency. Do you think that a transformer would work better than the tuned impedance coil that I am now using?—John Hauge, R. 1, Box 21, Ulen, Minn.

The circuit diagram you enclose has one error. The condenser and grid leak should be placed in the grid leak of the second tube instead of the first. As it is you are using it as a detector instead of an amplifier.

If you make this change the circuit should work satisfactorily. This type of radio-frequency is more efficient than transformer coupled, inasmuch as you can tune your R. F. tubes and get better tuning. By all means keep the present set, and just change the grid leak as directed.

* * *

In RADIO WORLD, *July 21, was described a midget set by Dick Roberts. Will you kindly furnish a diagram of the set as described? Will you kindly furnish all the constructional details, such as the winding of the coil and the apparatus and size of wire used in the set. What kind of a tube is used?—Newton Dringel, 14 Johnston St., Wilkinsburg, Pa. S. K. Fountain, Rocky Mt. N. C. Frank Kontout, P. O. Box 270. Oakville, Conn. L. J. Snyder, Pierson, Iowa. Harry J. Hubbard, 64 Katherine St. New Bedford, Mass. J. Schwartz, 3409 Benitan Ave., Detroit, Mich. G. H. Richardson, 310 Filmore Ave., Plainfield, N. J. Walter C. Sperber, 146 West 62nd St., New York City. Mathew Jordan, 33 Coenties Slip, New York City. Anthony Suir, Shoreham, N. Y. John A. Dengler, Jr., 218½ N. Minn St., New Ulm, Minn. Dr. Hugo S. Thomson, 535½ Main St., Springfield, Mass.*

The diagram as well as the constructional details of the circuit are published in this issue of RADIO WORLD. The address of Dick Roberts is Box 573, Miami, Oklahoma.

* * *

In the upper right hand corner of page 17 of RADIO WORLD, *July 14, you show a new loud speaker, which I have heard was invented in France and is said to be a wonder. Can you give me some information as to where it can be obtained?—Arthur Hammikson, Prince Bros. Service, Sayre, Okla.*

We do not see any mention of the new loud speaker. The picture in question shows a Marconi wagon being used to initiate the rural towns of England to radio. The speaker used looks to us like a regular loud speaker with a straight horn instead of a curved one.

* * *

I recently bought a W. D. 12 tube which was supposed to be new. After a week's use it ceased to light. Is there any way of determining whether it was a rebuilt tube that was sold to me for a new tube? Can I buy these tubes directly from the manufacturer? —Alf Hjembo, 11 Stephens Place, Port Richmond, N. Y.

There is no way in which you can determine whether a tube has been re-built if it is done cleverly. If the tube was sold in a sealed box, the manufacturer guarantees it, but not after use. You can buy these tubes from the manufacturer.

* * *

I have constructed the W. D. 11 circuit described by Ortherus Gordon in RADIO WORLD *for Jan. 20. Three people have looked over it and cannot get it to function. I cannot get a single sound out of it. Kindly tell me what is the trouble.—C. M. Adams, Alpine, Washington.*

Reverse your B battery leads so that the plus will go to the phones and plate and see if that does not help you out.

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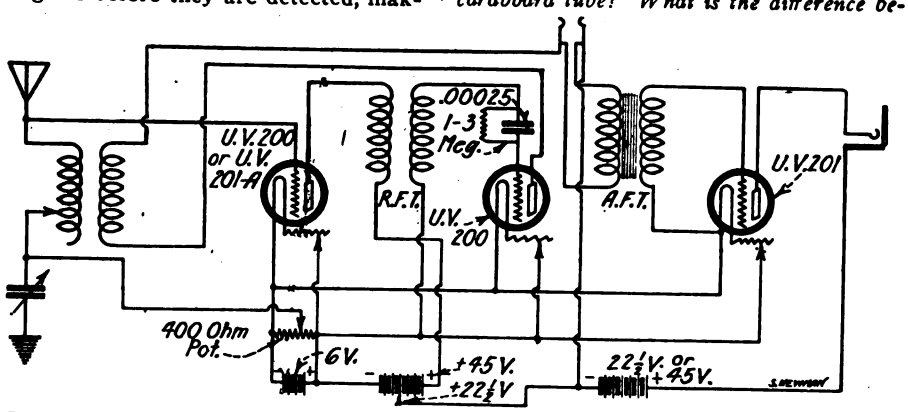
Will you kindly give me the following information: The constructional details of the "moving coil" element of the Magnavox. Also the details of the step down transformer that is used.—Harry A. Higginbotham, Orland, California.

As this is a patented device, the details must be secured from the manufacturer.

* * *

I have built the set described by Arthur S. Gordon in RADIO WORLD, *April* 14. *I now wish to add either one stage of radio-frequency amplification, or an additional stage of audio-frequency amplification, whichever you think will be best to increase my distance. What kind of tube should I use? What type of transformer? I am using a UV-200 for detector and a Cunningham for the audio-frequency amplification. What tube should I use for the circuit you mention? Will I need any additional batteries? Will the additional tube you mention enable me to operate a loud-speaker? — Charles G. Rose, P. O., Lorain, Ohio.*

The circuit you desire is published herewith with the addition of one stage of radio-frequency amplification, which is the best method of increasing the distance of a receiver. Audio-frequency will not increase distance, as it will only amplify signals that are audible with the detector itself, whereas radio-frequency amplifies the signals before they are detected, making possible signals that would not be audible without it. A hard amplifying tube such as the UV 201 or 201A is best for this purpose in the six-volt tubes. The transformer is optional—buy the best you can, as we do not recommend any types of competitive apparatus. An additional 22½ or 45 volt B battery in the plate circuit of the third tube will be necessary, as shown. It is questionable if a single step of radio added to the set you mention will increase your volume enough to enable you to operate a loud speaker. Radio-frequency does not increase volume so much as distance, and you will notice only a slight increase. With a set such as this, however, you should be able to get fair results on local stations with one stage of audio.



Circuit diagram asked for by Charles G. Rose. It is the Sorenson circuit with an additional stage of radio-frequency for distant reception. Extreme care should be taken in the rewiring of the circuit if good results are to be expected. Do not run wires parallel and watch your battery leads.

* * *

In RADIO WORLD, *June* 23, *you published a diagram of the D7 De Forest reflex circuit. Will this circuit produce as loud signals as a regenerative receiver using a detector and two steps of amplification? What capacity is the condenser between the secondaries of the third radio-frequency transformer and the crystal detector? Where can I purchase the .0015 condensers, as well as others of high values? Would separate rheostats for each tube rather than single control be of any advantage?—C. H. Barnett, Box 384, Hagerman, New Mexico.*

This circuit properly constructed and operated will produce louder signals and get further distance than the circuit you mention. When you are using a circuit of this type you are getting the practical use of six tubes, compared with the three that you would get through the circuit you mention. The capacity of the condenser should be either .002 or .0015. The condensers can be purchased from dealers handling the Dubilier or Freshman apparatus. There would be no advantage in using separate rheostats and the controls would be complicated by their use. Stick to the original diagrams and plans in all circuits of this type if you expect to succeed. Half the failures are due to some bright idea that the builder gets when constructing the set.

* * *

What is the best type of coil to use in the "pup" circuit? How many turns should be used, and what is the position of the tap? Is it better to wind your own coils? If so, will you give me the details for doing same? —C. J. Neymaber, 735 Main Street, San Angelo, Tex.

A duo-lateral or honeycomb coil is preferable for use with this circuit. Use either a 50 or 75. The coil should be tapped at the designated turn from the inside. No advantage will be gained by the winding of your own coils unless you have all the means for doing it correctly.

* * *

Will it be of advantage to use a bakelite tube in the set described by R. B. Wilbur in RADIO WORLD *for July* 28 *instead of a cardboard tube? What is the difference between a 23-plate .0001 and a 23-plate .005 condenser?—August Grubel, 331 East 38th Street, New York City.*

It is of decided advantage to use bakelite in place of cardboard wherever it is possible in the construction of coils. We do not know that anybody is making condensers of the .0001 capacity with 23 plates, but answering your question regarding the difference between them it is that the capacity of the .005 is fifty times as great as the smaller. We are not aware that these condensers are sold on the open market in that value of capacity. The general run of 23 plate condensers is .0005 mfd, and that of the 43 plate .001. Short waves are generally considered as anything below 600 and long waves anything above that. Due to recent allocations, however, the waves around 200 meters may be considered as short waves, and those from 600 up as the long waves, while those in between would be classed as intermediate waves.

* * *

Which of the two circuits, the Grimes inverse duplex or the improved Grimes duplex, is the best circuit for distance reception?—J. G. Jones, 3409 Beniteau Avenue, Detroit, Mich.

The Grimes inverse duplex is popular in two forms, the three tube and the four tube. You do not state which you mean. The improved Grimes as shown in RADIO WORLD is identical with the three tube set, the only difference being that Mr. Thompson has designed it to incorporate a stage of pure radio-frequency amplification ahead of the reflex tubes. Both are good sets.

MAGNAVOX
Radio Products

R3 Magnavox Radio The Reproducer Supreme

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The efficiency of the Magnavox Reproducer is due to its principle of construction.

Only the Magnavox (electro-dynamic) reproducer can re-create broadcasted programs according to their original *pitch, quality* and *volume.*

Without Magnavox equipment, no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . **$90.00**

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Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

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Mayor Curley, of Boston, Makes Broadcasting Suggestions

EDITOR, RADIO WORLD: I beg to acknowledge receipt of your letter of recent date and replying thereto beg to state that, realizing the complications which have arisen on account of the increasing popularity of radio broadcasting and the evident necessity for some form of regulation or control, I am led to believe that eventually a municipally controlled broadcasting station in various cities of the country may be the means of meeting present conditions as well as provide for the future development of radio service.

Boston is fortunate in having at least two first class radio stations whose broadcasting is known throughout the country, besides the Government station controlled by the Navy. So long as these stations serve the requirements and continue to be as willing as they have been heretofore to co-operate with any municipal requirement I hesitate to suggest that the City of Boston establish its own station at this time.

I believe that the real solution of the radio broadcasting situation is to have the proper national government agency plan for the proper supervision and regulation of this service as it already does in some matters and should with regard to a great many more matters in which the service and welfare of the people are concerned.

Very truly yours,
JAMES C. CURLEY,
Boston, Mass. Mayor.

A Loud Speaker Tip

MANY times when a loud speaker is used with two steps of audio-frequency amplification, the diaphragm of the loud speaking phone has a tendency to rattle. If the loud speaking phone is of the type that resembles a regulation telephone and the diaphragm can be removed, cut a small washer of thin cardboard just the size of the phone and about the thickness of the rim of the phone, and place it under the diaphragm. This will lift the diaphragm above the pole pieces of the magnets a slight bit and stop the rattle, which is caused by it hitting the pole pieces.

Do not use thick cardboard, or the distance will be too great and the sound will be impaired. The cardboard used by the laundries to keep shirt bosoms straight will be about right. Also be sure to keep the cap screwed on tightly or else the rattle will be worse than before.

Another Appeal to Our Readers

EDITOR, RADIO WORLD:

I am a cripple and have not walked, except on crutches, since I was nine years old. I am now 37. I have always been self-supporting since I was 15 until the last year. I am not able to get about very well. I have necrosis or tuberculosis of the bone.

I am very much interested in radio. I was thinking of making a crystal set, but since the discontinuance of KFAT at Eugene, Ore. (20 miles from here), I will have to have at least a single tube set, if I am to enjoy radio.

If any of the readers of RADIO WORLD who have some spare parts they no longer need will kindly send them to me, I am able to build a set myself. I sure will appreciate them. Respectfully yours,

C. R. COCHRAN.
Box 434, Cottage Grove, Ore.

(RADIO WORLD has investigated Mr. Cochran's statements and finds them correct. His case seems to be deserving. Readers who care to accede to his request are advised to correspond directly with Mr. Cochran.—Editor.)

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

George Usher, Box 63, Miami, Fla.
J. J. Borris, 508 North Fifth St., Harrison, N. J.
Franklin Washburn, 1240 Allston St., Houston, Texas.
W. T. Praster, 46 North Main St., Pleasantville, N. J. (Retailer.)
Dr. O. E. Johnson, Rock Rapids, Iowa.
S. C. Quinn, Northern Pacific Ticket Office, Bismarck, North Dakota.
Robert A. Sage, 223 North Fourth Ave., Washington, Iowa.
V. M. Smith, 309 West Latham Ave., Hemet, California.
Martin N. Jefferson, 2920 East 97th St., South Chicago, Ill. (Will soon open large radio service station. In market for radio goods of all kinds.)
George M. Butler, 5 Ashland Terrace, New Bedford, Mass. (Wants low cost crystal set for mail order trade.)
Fred Cochrane, Jr., A. I. R. E., 137 East 122nd St., New York, N. Y.
James Boa Company, Ltd., 10 St. Sophie Lane, Montreal, P. Q., Canada. (Will do a strictly wholesale radio business. Want lowest jobbing prices from manufacturers.)
George T. Zaffer, Winston Electric Co., 75 Union St., Flushing, N. Y. (Distributor and retailer.)
The H. Wellman Electric & Mfg. Co., Ashland, Ky. (Has organized a radio department and will soon stock up for early fall trade.)
Ivan H. White, 315 Joseph St., Charleston, W. Va.
H. H. Rockenbach, Fairbury, Ill.
J. A. Hawthorne, 3049 Ocean Ave., Brooklyn, N. Y. (Distributor.)
Joseph Powers, 51 Gardner St., Allston, Mass.
C. E. Whalen, North Amherst, Mass.
Jos. A. Cross, 428 East Lane Ave., Columbus, Ohio.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

AMERICAN RADIO RELAY LEAGUE, second national convention, Chicago, Ill., September 12-15, 1923. Chicago Radio Traffic Association, 959 The Rookery, Chicago, Ill.

The Indorarial

THE C. B. Cooper Company, 154 Nassau street, New York City, are sole selling agents for the "Indorarial," which resembles a piece of wall paper with a metal strip at each end. It can be rolled up and carried, making a good aerial for a portable set. Placed in a closet or under a rug, it makes an efficient indoor aerial which is out of sight. Interesting results are obtained by various combinations of one or more Indorarials.

Radio World's Remarkable Subscription Achievement

ONE of the most difficult things in the publishing business is the building up of a subscription list. A year ago subscriptions came tumbling into the office of RADIO WORLD. That was all very well, but we wondered at the time if it was simply evidence of the fact that everybody was radio crazy. Would RADIO WORLD stand the gaff when it came to renewals?

RADIO WORLD is standing it, and amazing those who have had years of experience in the publishing business. The large percentage of renewals received on expired subscriptions is extraordinary. An army of people not only subscribed for RADIO WORLD last year, but are renewing their subscriptions this year—even in the summer time—in a manner seldom known in publishing experience.

In other words, RADIO WORLD has qualified. It has achieved that enviable position where it can say of its subscribers and newsstand purchasers with almost literal truth, "Once a reader, always a reader."

Ask the average publisher what he thinks of the statement that any publication can, besides daily adding new subscribers in large numbers to its list, induce almost 90% of its old subscribers to renew. Most publishers would say it is impossible. RADIO WORLD is doing it right now, and has the renewal orders to prove it.

THE BUSINESS MANAGER.

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Newark, N. J., Making 3500 "Bootleg" Vacuum Tubes a Day

By William McNeary

Radio Editor, Newark Sunday Call

THE bootlegging of vacuum tubes used in radio receiving sets has grown to be one of the most widely practiced and highly profitable by-products of prohibition. Its importance is second only to the business of rum-smuggling itself. With a potential market of nearly a million dollars worth of tubes per month, the radio bootlegger is playing a big game. His net profit is generally as large, if not larger, than that of the whiskey runner and his danger of apprehension and punishment seems much less.

Beginning about a year ago on a small scale with the manufacture of various crude types of tubes which were easily spotted, the radio bootlegger has developed his business to the point of so skilfully and accurately counterfeiting the products of several prominent manufacturers that only an expert is able to detect the difference. In the course of examining the receiving sets of about forty amateurs a day for the past year and a half, the Newark Sunday *Call* has been afforded an unusual opportunity of examining a large variety of vacuum tubes, and whereas it was formerly a very simple matter to detect a bootleg product because of its faulty construction, the job has now become one requiring the closest examination.

The manufacture of the so-called "standard" vacuum tubes is in the hands of a closely knit group comprising the General Electric Company and the Westinghouse Electric & Manufacturing Company, from whose factories come the UV200, UV201, UV201-A, UV199, WD11, WD12 and, in addition, a series of tubes used largely in transmitting circuits. These tubes are sold through the Radio Corporation of America to the jobbers and dealers of the country. From the General Electric factories also come a series of tubes identically the same as listed above, but bearing the trade designation C300, C301, C301-A, C299, C11 and C12 and the signature of E. T. Cunningham. These tubes are widely used on the Pacific Coast and have recently been introduced into New Jersey.

Another important manufacturer of standard tubes is the Western Electric Company, makers of the VT1 and VT2, used extensively by the Signal Corps of the United States Army, the 216-A used as a power amplifier and the "N" (peanut) tube employed as a detector, as well as a radio and audio amplifier. The latter tube, although not sold for amateur and experimental use in this country has attracted considerable attention here. The interest thus aroused has been capitalized by the bootleggers, who have placed copies of this tube on the market.

The development of "standard" vacuum tubes to their present high point of efficiency has been achieved only after the expenditure of hundreds of thousands of dollars by the companies mentioned above. The patents resulting from this costly experimentation represent a form of protection for the manufacturer against the pirates of industry who seek to profit by the fruits of another's labor and brains.

Patents mean nothing to the radio bootlegger, however. Not only does he steal the fundamental principle which has taken a legitimate firm years to develop, but he completes the job to the last detail by counterfeiting the tube in size, shape and even in the design of the trademark.

Newark is reported to be the biggest source of bootleg vacuum tubes in the country, but, strangely enough, fewer bootleg tubes are sold in this city than in any radio center of its size and importance in the United States. The local public is afforded a large measure of protection through the integrity of the dealers and through the medium of the personal service feature of the Sunday *Call's* Radio Department, which is available for testing tubes and apparatus every day except Monday from 2 to 5 P. M. A constant watch over the radio market is maintained by the *Call's* staff for the protection and information of its readers. Because of this fact radio bootleggers find it more profitable to seek other dumping grounds for their products.

From a source believed to be very reliable the Sunday *Call* learns that there are approximately seven "factories" engaged in the manufacture of bootleg tubes in this city. The combined capacity of these plants is figured at 3,500 tubes a day. There are five additional factories in New York and Brooklyn, this latter group being capable of producing about 2,000 tubes a day.

The reason Newark is such a big manufacturing center for bootleg tubes is because this city and vicinity affords the greatest market for skilled labor and materials, vital necessities to the bootlegger. In Harrison, just across the Passaic River from Newark, is the General Electric plant, employing thousands of workers, mostly girls, on the various processes of vacuum tube construction. In Bloomfield, another suburban town, is the Westinghouse Lamp Works, also employing thousands of trained workers on radio tubes. In these factories inexperienced labor is taken and thoroughly trained in the delicate work of tube making. Once thoroughly trained and experienced, this labor is recruited by agents of the bootlegger who are known to have approached workers leaving the factories. Higher wages is the usual bait, but bonuses are offered to the girls skilled in the more delicate branches of the work.

With this labor at his command the bootlegger is better able to carry out the details of counterfeiting standard tubes. There have come to the attention of the Sunday *Call* some excellent copies of the UV199. It is difficult to tell the copy from the original. Its weakness is in its extremely short filament life, the average bootleg lasting only a few hours as against 1,000 hours, the normal service of a standard tube. The bootleg 199's examined have a higher rate of current consumption than the genuine and a low percentage of electron emission, which means poorer service. This is largely because the bootlegger is unable to obtain the proper filament material and is obliged to substitute a flattened platinum wire, which, incidentally, is also obtainable locally.

The counterfeit UV199 is distinguished by the fact that the R. C. A., G. E. and W. trademarks impressed in white on the glass may be erased by rubbing a moistened finger over them. On the genuine these trademarks are etched on the glass and cannot be removed. The printing on the base of the tube is frequently badly smudged on the bootleg, whereas on the genuine it is quite clear and readable.

In addition to counterfeit UV199, the Sunday *Call* has discovered fake Western Electric "N" tubes, UV200 and UV201, DeForest DV6, WD12 and UV201-A.

Radio Trade Notes

Frank La Valle, 2529 Cambrilling Ave., New York City, informs RADIO WORLD that he would like to go into the radio retail business and wants to hear from manufacturers of parts.

* * *

C. B. Gowan and R. L. Lockett, 515 Galveston Ave., Fort Worth, Texas, are in the market for radio supplies, especially parts.

* * *

The L. C. Warner Co. has removed to large quarters at 305 Occidental Ave., Seattle, Wash.

A. W. Stitt & Co., 127 York St., Sydney, Australia, want to import all kinds of radio apparatus.

* * *

Sterling Miles Radio Co., 288 Judson St., Pontiac, Mich., is in the market for parts, radio books and mailing lists.

* * *

Geo. W. Reeffin, 41 Fifth Ave., Brooklyn, N. Y., wants electrical measuring instruments, coils and other parts.

* * *

Shippard Radio Co., 315 East State St., Jacksonville, Ill., wants prices on an extensive list of parts.

New Radio and Electric Firms

Tel-U Signal Corp., New York City, electrical devices, $600,000; V. Taylor, J. F. Hughes, R. L. Deely. (Attorneys, Phillips, Leibell & Fielding, 54 Chambers St.)

International Electrical Supply Co., New York City, $25,000; W. P. Plummer, P. R. Cornelius, J. C. Lerentzen, Jr. (Attorney, F. J. Knorr, Albany, N. Y.)

Knickerbocker Radio Equipment Corp., New York City, $5,000; M. Finkelstein, H. Sallinger, E. Rosenbaum. (Attorneys, Goldstein & Goldstein, 366 Broadway.)

N. Hirschfeld Electrical Supply Co., New York City, has changed its name to Hirschfeld Electrical Supply Co.

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The Condenser Sensation of Modern Radio

Through the accuracy and dependability of Freshman Condensers, hook-ups and circuits have been perfected which have completely revolutionized the art of Radio Reception.

These little Storers of energy and rectifiers of Radio Current are the very heart of a well-built radio set.

The proper fixed condenser will make all the difference in the world in the reception, clarity and selectivity your set affords.

Capacity	Each	Capacity	Each
.0001	$ .35	.002	$ .40
.00015	.35	.0025	.50
.00025	.35	.003	.60
.0002	.35	.004	.75
.0003	.35	.005	.75
.00035	.39	.006	.75
.0005	.35	.008	1.00
.0006	.40	.01	1.00
.0008	.40	.015	1.50
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By W. J. Merritt Garvey, of New York World's Radio Section, Handbook of Helpful Hints for Radio Set Builders, includes tables, charts, legends, statistics and carefully selected hookups with diagrams and full descriptions. Reading this interesting book we discovered Mr. Garvey recommended the FIL-KO-STAT. We bought an edition of the books and will gladly send a copy anywhere at handling cost 10c. postpaid.

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Public Health Service Warns Against Poison Ivy and Poison Oak

VACATIONISTS who carried their radio receiving sets with them on their jaunts this summer are not suffering from the want of advice on health. Thirty broadcasting stations in addition to NAA, Naval Radio Station, Arlington, Va., have been releasing health hints for vacationists furnished by the Bureau of the United States Public Health Service at Washington. The most recent of these broadcasts on the subject of poison ivy is especially timely, since every summer brings its toll of suffering from this cause.

The poison ivy is perhaps the plant most frequently encountered by the unsuspecting city visitor to the country, says the Public Health Service. Yet it may be easily distinguished from other creepers by its three divided leaves. The harmless creepers have five leaves. This one distinguishing mark if borne in mind will protect the vacationist from poison ivy. Poison oak is a shrub or small tree with broad leaves very much resembling the leaves of the oak tree.

The part of these plants to be feared is the resinous sap. When a plant is injured this sticky sap exudes. It comes in contact with the skin and sets up an irritation which is distinguished by its acute character. This irritation frequently begins between the fingers.

The symptoms of ivy poisoning are comparatively easy to recognize. A more or less mild attack may be ushered in by a burning or itching of the skin. Within twenty-four hours after the skin is exposed to the poison of the plant, a red rash appears. This is followed by more or less swelling and itching; then small blisters filled with serum make their appearance. The parts of the body affected may swell to enormous proportions.

At one time it was believed that many persons who had suffered from attacks of ivy poisoning would experience a recurrence of the attack if they passed through a wood or came into proximity with the plant even though the ivy itself was not touched. It now appears certain, however, that contact is necessary in order to produce ivy poisoning.

Ivy poisoning, says the Public Health Service, may sometimes be averted even after these plants have been handled provided the parts exposed are washed thoroughly with soap, water and alcohol. This washing must, however, be thorough, otherwise it will only tend to spread the irritating poison.

The treatment of ivy poisoning is simple and easily administered. One of the best treatments is bathing with salt water. Sea water is best if it is available. Another good application consists of one teaspoonful of boric acid in a quart of hot water. The affected parts should be bathed with warm water every day or every two days and carefully dried without rubbing. Bathing should be followed by another application of boric acid. The attack may subside in from four to six days. The best advice to vacationists is, study the poison oak, the poison ivy and the poison sumac so you may distingush these plants from their neighbors. Once you are able to recognize them you can scrupulously avoid them. Avoid the creeper with the three divided leaves. Avoid the small shrub with the broad leaves like the oak. Give the sumac that grows in swampy places a wide berth. Persons who have suffered from plant poison do not soon forget the experience .

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A $300 Prize Contest for Radio Music

DO we have our jazz regularly with our bedtime story or not? That is the question that now confronts hundreds of thousands of families who have invested in radio receiving sets as they sit back awaiting the result of the broadcaster-music trust controversy.

It started with the sort of half scared claim of the publishers and authors of popular music several months ago, that the use of their compositions for radio broadcasting purposes was detrimental to its sale and, incidentally, disastrous to the profit sides of their ledgers.

The broadcasters, rendering a free service to the public, contended that the broadcasting of these compositions could have but one effect upon them—an increase in their popularity with an according increase in their sale. And so the matter stood for several months.

The claim of the publishers has ceased to be a whimper. It has now developed into a demand, a bold demand for royalties that, if necessary, will be backed to the limit by legal action.

With locked horns the opposing factions are now marking time and in the meantime the great fraternity of radio fans sits back and awaits judgment on what, to them, is an important question.

Radio News, a publication devoted to the interests of radio, has stepped in, not to referee the bout, but to attempt to solve what is a problem of concern to hundreds of thousands of families that have made room, at more or less expense, for this new means of emanating canned music. A decision negative to the interests of this great fraternity will undoubtedly bring about even a greater wail than that of the dreaded static or ether hog.

The solvent, that purposed to unlock the horns and bring the controversants to a state of amiability and more congenial relationship will be the publication, by *Radio News*, of two musical compositions, one a march and the other a "jazz" piece, which will be chosen in open competition, and promoted entirely by radio.

The popularity of these songs, the success of their sale, will be traceable directly to their use as radio broadcasting selections as they will not be promoted through any other medium. This success, which seems to be measured by the number of office boys who whistle it, will be the proof of the contention that radio broadcasting helps to "make" a song.

In the September issue of *Radio News*, Mr. H. Gernsback, editor of that publication, states, editorially, that radio has made many a bad show good and has had the same effect upon music, that is, radio has not changed the quality of either but it has done much to increase attendance and sale of good shows with poor attendances and good music with poor sales records.

Those who will judge the contest will be Hugo Reisenfeld, conductor of the orchestras of the Rialto, Rivoli and Criterion theaters of New York; Ted Lewis, of the well known Ted Lewis band and Ted Lewis Frolics; Vincent Lopez, director of the Hotel Pennsylvania orchestra, New York; Milton J. Cross, announcer of radio broadcasting station, AJN, New York, member of the Institute of Musical Arts and of Paulist Choristers; Leo B. Riggs, musical director of the Hotel Astor Bands, and H. Gernsback, editor of *Radio News*.

Three hundred dollars in prizes will be awarded in the contest, one-half for the best composition in march time and a like amount for the best composition in "jazz" time. The winning contestants will also be paid a generous royalty upon the sale of their compositions so that two new popular song writers will also be "made" by radio

The conditions of the competition, as mentioned in the September issue of *Radio News*, follows:

1. Each composition to be not longer than the usual four pages.
2. Contestants may send in more than one composition. There is no restriction as to number.
3. All compositions to be executed in the usual manner, using the usual musical symbols.
4. Compositions to be entitled "Radio March" or "Radio Jazz," as the case may be.
5. Authors unable to write down music themselves, may have a musician do this for them.
6. All manuscripts to be submitted flat, not rolled.
7. All manuscripts not accepted will be promptly returned to the owners at the conclusion of the contest, provided sufficient postage is enclosed with the manuscripts.
8. All prizes will be paid upon publication.
9. This contest closes in New York on October 1, 1923.
10. Address all contributions to Editor, Radio Music Contest, *Radio News*, New York.

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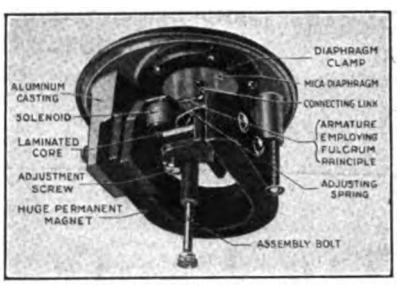

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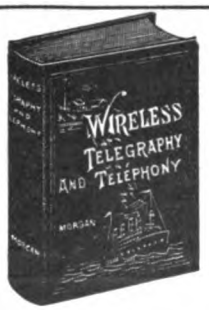

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Letters which come to the radio broadcasting station emphasize the enjoyment which the "stay-at-homes" get from broadcast music. To many of them "air" entertainment is the only pleasure that breaks the monotony of passing time. To many radio brings for a time at least forgetfulness of suffering. One such letter is that received recently by the General Electric Company station WGY at Schenectady, N. Y., from a young blind woman who lives in Seneca Falls, N. Y. She was graduated from college after working her way through aided by the limited means of her parents. While taking a year's work in normal school to fit herself for teaching a serious illness brought on blindness. She had to provide a living for herself, her aged father and mother and she became a masseuse. Writing to WGY, she says:

"If you could know how much we enjoy the voice of the Schenectady station, you would be glad that God gave you such a gift. My father, who is very hard of hearing can hear you distinctly and knows your voice already although we are only two weeks old in the radio world. Father could get nearly all the service and sang the hymns with the choir.

"The work of massage is so very exhausting that even when there is an invitation to get some recreation, physical weariness makes it impossible to enjoy anything. The constant association with sick people, the worry of expense and the strain of trying to do things without sight, the care of a father who has been feeble a long time, and the anxiety of a mother 74 years old who has had to work so hard to serve a deaf husband and a blind daughter, all these things brought me to a dreadful state of mind, distrusting everybody and sorry for myself. No honors conferred on a celebrity could have given greater pleasure than the church service gave two people, one deaf and the other blind and hungry for something good and helpful. The talk which I heard about Christ and Christianity was a greater banquet than any that was ever spread before the greatest man.

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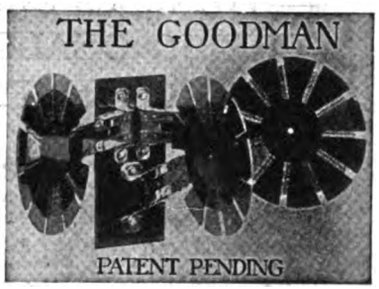

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What Is a "Radario"? Here's the Answer

T. C. O'DONNELL has written several plays and stories for children and spoken to a world-wide audience from Station WLW, Crosley Manufacturing Company, Cincinnati, "the station with a soul." His plays appear every month in *Child Life* magazine. He has made a study of the radarios written and produced at WLW, and has written the first original radario for children. This is called "The Magic Journey" and will be given in September from the broadcasting station.

There may be some new radio set owners who do not know that radario plays were originated by Fred Smith, director of the WLW studio, but most of the radio audience during the past year know about this and their enthusiastic letters have encouraged the production of these plays on even a larger scale than heretofore. Mr. O'Donnell, who is also editor of *Writer's Digest*, which is conducting a $100 prize contest for the three best radarios submitted, has this to say about them:

"The word radario can best be defined by giving a brief history of the broadcasting of one-act plays, as written for and produced upon the stage. In this, station WLW was the pioneer. It was found that with the aid of occasional interpolations by the studio director, describing the entrance and exit of characters, and with each part given by a reader with a distinctive voice, it was possible to render the play so clearly that the listener could readily follow the play.

"But—directions by the studio director did interrupt the dialogue and the action of the play, and to that degree the play failed to be perfectly adapted to radio broadcasting. Mr. Fred Smith, studio director at WLW, hit upon a means of obviating this difficulty. His idea was so to construct the play that the dialogue would convey to the listener the entire action.

"For example, in a scene with two young women conversing about the young man whom they are expecting, upon his appearance the studio director in the regular play would have said: 'At this point Reginald Fairfield enters and greets the young women.' The radioized version would be something in this manner:

"'PHYLLIS: Oh, here comes Reggie now! . . . . . Hello, Reggie!'

"'REGINALD: Why, here you are! Hello, Phyllis! Hello, Dorothy!' and the dialogue would go on smoothly and the entire action be as clear to the listener as though the studio director, or 'descriptionist,' as he is now called, had described the action.

"To this new form Mr. Smith gave the name 'radario,' a word which has quickly become fixed in the language, so that the publishers of the Standard Dictionary have announced that the next edition of this work would contain the word and its definition.

"Mr. Smith also wrote the first radario, 'When Love Wakens,' the title initials being the letters which denote the station WLW. This was broadcast early in the year and was followed by other radarios, one of these being a clever radioization, if we may use the term, of Moliere's 'Trader Turned Gentleman.'

"An essential of the radario is that it tell a complete story; in other words, that it have a plot. Also it must be brief, not occupying more than twenty minutes on the program. And if variety is introduced in the form of a song by one of the performers, or a bit of orchestra music, or a novelty like a whistling solo, so much

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What IS Genuine Orange Pekoe?

IT has nothing to do with oranges. "Orange Pekoe" is simply an oriental term to denote one of the different gradings of tea. And here is the point you should keep in mind when you buy Orange Pekoe Tea—There are three distinct gradings:

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in

The RADIO Sun-Globe

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NEW YORK, SATURDAY, AUGUST 4, 1923.

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The Sleeper Monotrol

The First of a Series of Three Articles Describing the Construction of the Latest Type of Grimes Inverse Reflex Receiver

By DAVID GRIMES

WHEN a new radio circuit, however wonderful in its essentials, is put to the acid test of commercial use, then every little detail must be explored, and every difficulty located and solved in order to produce an instrument that Mr. Average man or woman can operate with full success and pleasure. Ever since first announ-

small loops for reception, which were mounted in the aeroplanes directly behind the operator's seat, so that they could be rotated by him in the direction of maximum or minimum intensity. The set was placed beside the operator and the batteries at his feet.

The proble- -educing weight in -e bombing

This basic idea was not new, as it dated back to 1913 and 1914, with credit due to two Germans. These men had even taken out foreign patents, the United States patent having been granted to them in 1914. Most of the widely advertised one tube reflexes recently on the -ar- direct uses of the German

T- -sic idea showed

THIS was the first of three important articles describing the famous Grimes Inverse Duplex Circuit—latest and greatest of all 3-tube circuits as incorporated exclusively in the **SLEEPER MONOTROL**—"the most perfect radio set in America."

Both the set and articles describing it have caused a stir in the leading radio publications throughout the country. We will be glad to send you our booklet describing its extraordinary features.

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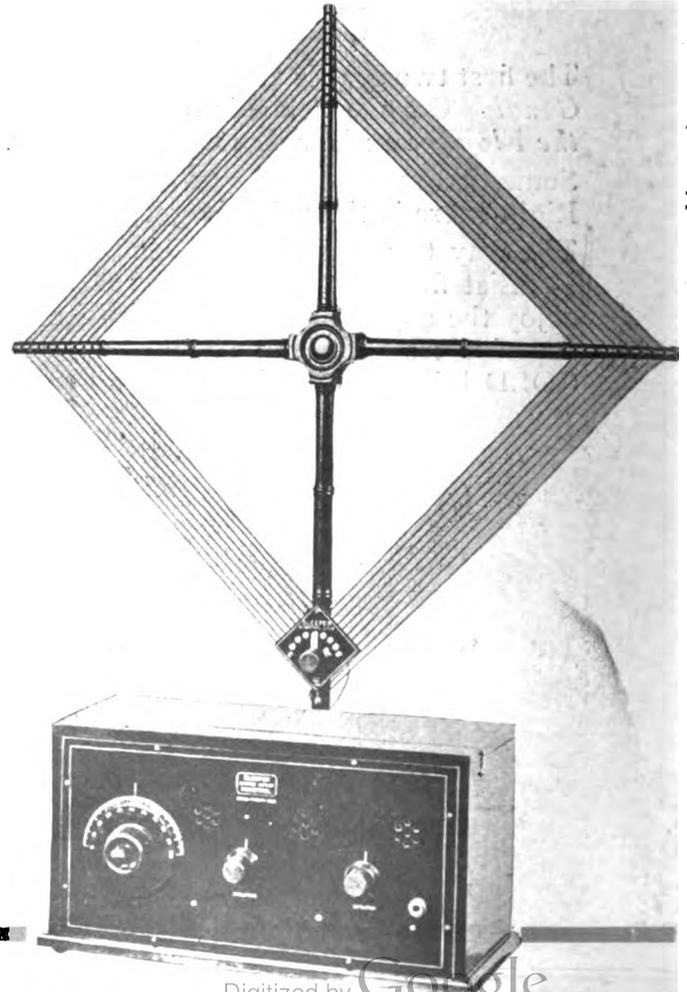

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(C. Kadel and Herbert)

Gets sorta lonesome these days for the girls up in the mountains, when nearly all the boys have gone back to work. But these lucky misses, Peggy Stohl, Betty Nevins and Muriel Harrison, do not seem to mind simply because they had the forethought to take their radio set along with them up to their woodland home in the Adirondacks. The photographer wanted to know why they didn't dress and dance like regular wood nymphs, but they said the music for such things couldn't be had by means of a jazz band and that is all that was on at the time, so he had to be content with a tango fox trot.

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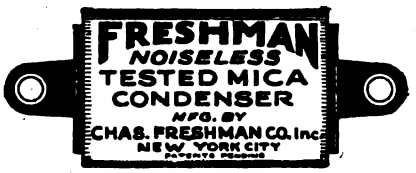
The Condenser Sensation of Modern Radio



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WGY Offers $500 Prize for Radio Drama

WGY, the radio broadcasting station of the General Electric Company at Schenectady, N. Y., offers a prize of $500 for the best radio drama submitted in competition during the three months' period beginning September 1.

The prize-winning play will be presented by the WGY Players during the winter months when transmission conditions are at their best.

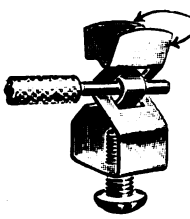
The screen has evolved a distinct type of drama, which depends solely on the eye for its appreciation; tomorrow the radio drama will be so written that the listening ear and imagination unaided by the eye will be satisfied. It is for the purpose of stimulating and encouraging the development of the radio drama that the General Electric Company inaugurates this prize competition.

The author of the radio drama must place himself in the position of writing for a blind man. The lines of the characters must convey a picture of the scene in which the action takes place. This apparent limitation or handicap becomes an aid to action, however, as the writer need not restrict his play to three, four or five scenes. For example, he can depict an automobile race and carry his audience through its exciting phases by means of the lines. He may take his listener from room to room or floor to floor in a dwelling, if farce or melodrama call for such action. The chase, long a popular feature in the early motion pictures, may be brought into the radio play by means of speech. The radio drama requires no scenery. No careful search need be made for locations. The spoken words build the scenery.

Dramatic situations may be built up by the speaking voice and through the medium of sound-making devices. The writer is encouraged to make use of sound devices and the engineer will provide a means of producing through the air a counterpart of the prescribed sound. Rain, thunder, surf, the roar of a moving train, a pistol shot, an airplane, telegraph key or automobile motor may all be reproduced in sound to impart atmosphere and realism.

Those who have written short stories, books of fiction, scenarios or plays, successfully or unsuccessfully, may have the germ of a prize-winning radio drama. If you are interested address Prize Competition, WGY Broadcasting Studio, General Electric Company, Schenectady, N. Y., for a folder which sets forth the rules of the competition with an outline of the special requirements of the radio play.

PERFECT CONNECTIONS



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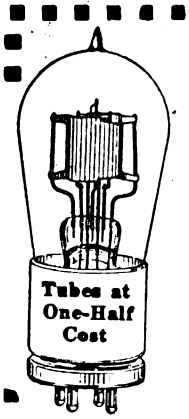
Station WEAF Sends Out Questionnaire

W. E. HARKNESS, manager of broadcasting for the American Telephone & Telegraph Company, New York, has sent to thousands of radio listeners in an elaborate questionnaire to which replies are requested without signatures. In an accompanying letter Mr. Harkness says:

"You want to have us provide you with the best possible programs. We want to do just this. You will realize that it is a difficult matter to cater to the tastes of an audience so large as that which we reach. In order that we may know more accurately of whom our audience is composed and what their desires are, we are sending the enclosed questionnaire to all our listeners who have been so kind and courteous as to write or telephone of their interest in Station WEAF.

"You will notice that the questionnaire is entirely impersonal and that you are not even asked to sign your name. All we want is to be able to compile statistics that will help us to conduct the station as efficiently as possible and to send on the air what will please our audience. A number of the questions may seem irrelevant, but we assure you that the information will help give us a real picture of our audience and their interests."



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VOLUME THREE OF

RADIO WORLD

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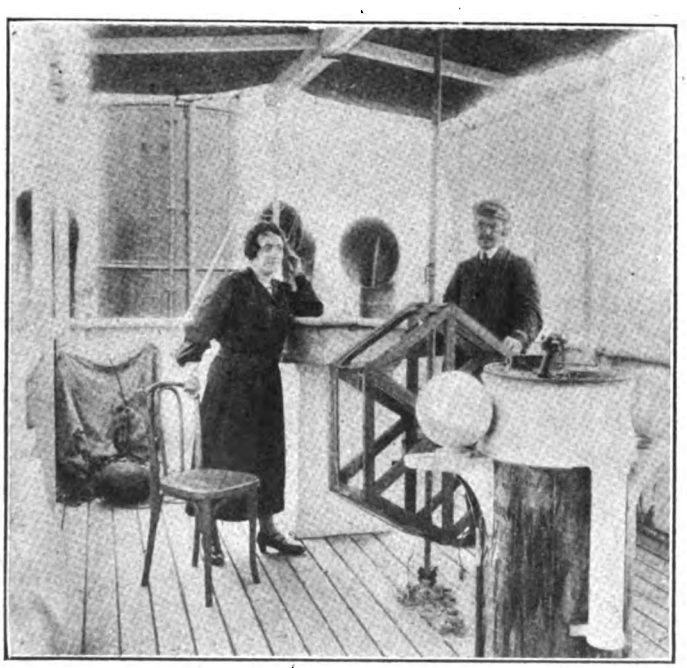
Details of a Ship's Radio Compass

By Captain L. Mauriet, S. S. "Syria"

IN RADIO WORLD, February 24, 1923, I described a receiver constructed by myself and used aboard my ship that was suitable for a compass receiver for ship bearings and fog signals, and also for the reception of broadcast programs from distant stations.

Since that time I have put in two more stages of both radio-frequency and audio-frequency which has added considerably to the range of my receiver. The same circuit was used for both the radio and audio-frequency as before so I do not think it necessary to furnish additional diagrams, as anybody can add the necessary apparatus by simply following out the original plans.

I use two stages of transformer coupled radio-frequency and the original one stage of resistance coupled radio-frequency because of the fact that I find that a stage of resistance coupled radio-frequency after two stages of transformer coupled radio-frequency has

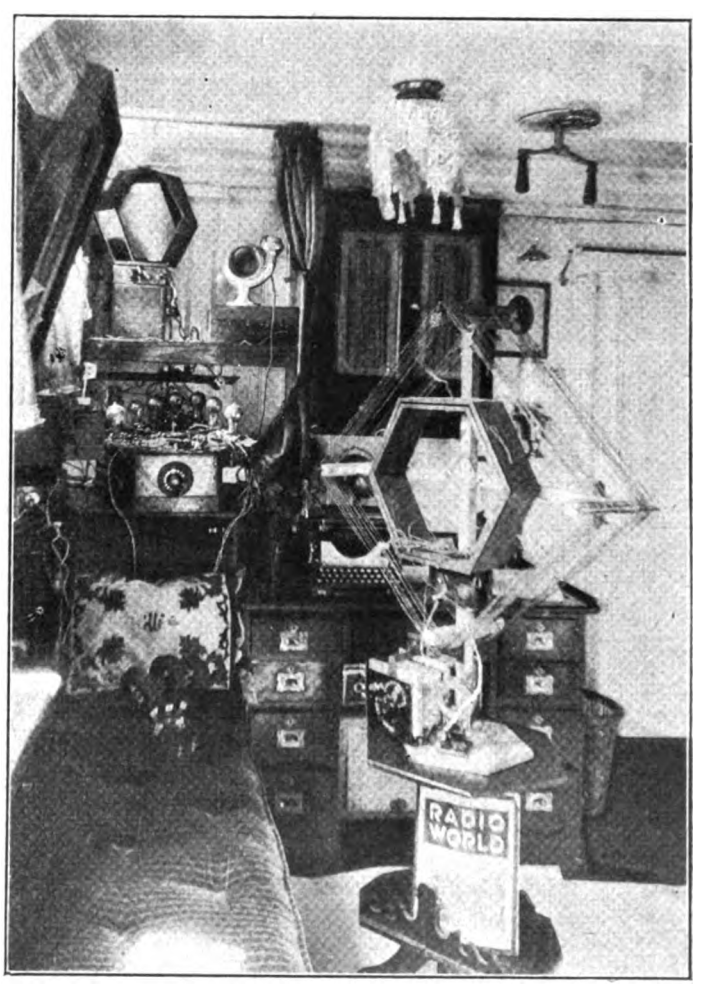


Navigating bridge of the S. S. "Syria" with radio compass. The loop antenna can be operated from the room below. Mrs. Mauriet and Captain Mauriet listening in to a program.

a stabilizing effect, making the set easier to handle. As to the audio-frequency, transformers are used throughout.

The set involves identically the same principle as the first, being constructed in four cabinets so shaped that they form a hexagon, as shown in the drawing. Connections are made by means of binding posts on the sides, with battery connections under the cabinet. This allows you to make a neat table of the entire set by setting it on a pedestal.

Of greater interest to ship builders and owners will be the construction of the practical loop, which is located on the top of the upper bridge, with the con-



In the captain's room on the S. S. "Syria." Seven-tube receiver at left and two forms of tuned loops. Handle to operate loop shown coming through from deck above.

trols passing through the deck to the cabin below, where the receiver is located.

The principal dimensions of the loop proper are: Vertical diameter, 3′ 3″; breadth, 10″; sides of hexagon, 1′ 6″; turns of wire, 20; total length of wire used, 180′. The loop standards are made of sound

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Daylight Radio Test by Amateurs

HARTFORD, CONN.—On the morning of Sunday, September 23, radio amateurs of either coast will attempt to beat Old Sol across the continent in spectacular daylight tests. Their transmitters will be pitted against sunlight in their efforts to relay messages across the country between sunrise and sunset, according to an announcement made here by F. H. Schnell, traffic manager of the American Radio Relay League.

At least ten picked amateurs on both the Pacific and Atlantic Coasts will start messages as the sun comes over the horizon and they will be relayed by intervening stations. By evening it is expected that most of the messages will have reached their destination and, for the brass-pounders, the contest with Father Time will end in a radio victory.

These tests have a real scientific value since they will demonstrate to what extent the sun affects transmission. Everyone familiar with radio knows that reception over long distances is more difficult during the daytime than in darkness, this being caused, it is believed, by the ionization of the earth's atmosphere by the sun's rays.

The disastrous effect of sunlight upon radio has been noticed by broadcast listeners, as well as amateurs, and it is confidently expected by league officers that definite comparisons may be drawn which will prove helpful in an investigation of this subject.

In this connection some interesting information may be gathered from the experience of Donald H. Mix, league radio operator with the MacMillan exploration party bound for the Arctic, since he must transmit messages and news reports through both daylight and darkness from the Arctic seas to amateurs at home.

"No one will know from what stations the messages will start," says Mr. Schnell referring to the daylight tests. "Everybody will have the same chance of picking up a message and relaying it along the line." He advises all amateurs to keep a record of everything they hear and whether they use standard or daylight time. These records should be sent to A. R. R. L. headquarters at Hartford, Conn., by October first.

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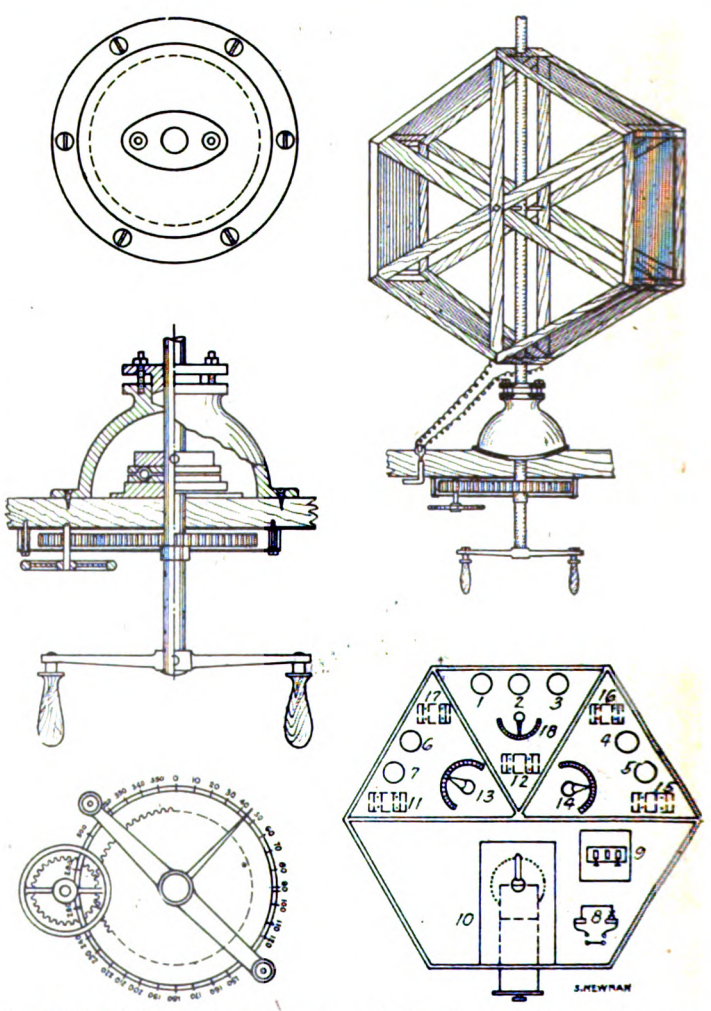
hardwood, such as oak or ash, which has been well kiln dried. The stock for the construction can be 1"x½" for all practical purposes, but for outdoor use I prefer to make it even heavier, using 1" square. Do not use iron nails or screws, or paint the standards as the metallic base of marine paint will form a conductor for the minute currents. Copper screws or nails should be used and countersunk, the top of the hole filled with putty and then the entire frame varnished with a good grade of marine varnish which is left to dry thoroughly before the wire is wound on.

The construction details of the stuffing box and bearings is clear from the drawings. They were constructed from odd material found laying around the engine room and consist of such odd parts as a Ford bearing and a discarded differential case (upper part, and two gear wheels). The handles are discarded control handles. Care should be taken if the installation is to be made on the deck that everything is carefully packed with oakum and oiled waste to prevent water from gaining entrance during a storm. The leads for the loop are brought down through a metallic bushing insulated with porcelain, and which has a heavy brass and porcelain collar to prevent leakage of water or radio energy. Such entrance insulators can easily be obtained from radio supply shops, as they are commonly used aboard ship to bring in the antenna.

By means of a chart located on the ceiling of the cabin and graduated into points of the compass bearings can be taken without having to take cross bearings, provided the course of the vessel is known, and the position of the transmitter on the map is known. The set will be accurate to a great degree, due to the construction of the loop and also to the sharpness of tuning obtained by use of the radio-frequency. If captains of ships realized the absolute comfort of knowing their bearings by radio, such as can be obtained by the use of the receiver described, every ship would have a loop receiver of some sort. During a fog when astronomical observations cannot be obtained for hours and sometimes days at a time, it is a great aid to the practiced navigator to be able to absolutely check his course in a few minutes and with as great accuracy as though observations were taken with the compass and sextant.



Constructional details of the loop for a ship's radio compass as well as the controls and packing box. Seven-tube receiver is shown in lower right hand corner. The references are as follows: 1—High frequency tube (radio-frequency); 2—Detector tube; 3—audio-frequency tube; 4-5—two stages of audio-frequency; 6-7—two stages of radio-frequency; 8—crystal detector; 9—honeycomb coils; 10—loose coupler; 11—radio-frequency transformer; 12—audio-frequency transformer; 13—condenser, 23 plates; 14—condenser, 43 plates; 15—audio-frequency transformer; 16—audio-frequency transformer; 17—radio-frequency transformer; 18—rheostat for detector tube. The set is made in four cabinets as shown—three triangular, containing the tubes, transformers and controls, and one large one containing the loose coupler, honeycomb coils and crystal detector.

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How to Improve Your R. C. Set

By R. L. Dougherty

MANY purchasers of the now famous RC sets, or the RA-DA combination receiver and amplifier units are well satisfied with the work performed by these receivers. However, it is only natural that they should inquire whether there is any method of improving the distance of these receivers, and also several other details.

Strange as it may seem it is extremely simple to add a stage of radio-frequency to these sets, *without disturbing a single connection on the inside of the apparatus.* Fig. 1 illustrates the method evolved by the engineers of the Radio Corporation of America for adding a single stage of radio-frequency amplification to their RC receiver. As the RC and the RA-DA combination are identical in every detail excepting that the RC is in a single cabinet and the RA-DA is in two only one diagram is required. With the RA-DA sets, the two units are in separate cabinets and the unit for the radio-frequency can be made and fitted between the two. If this is neatly done, and the general style of the manufactured cabinets followed out, the appearance will in no wise detract from the purchased receiver.

Referring to Fig. 1 it will be noted that the same A and B batteries are used for the radio-frequency and the detector and two stage, which simplifies matters considerably, and while a UV201 tube is recommended, with a six volt battery, the set will function if WD12 tubes are used throughout, with 1½ volt dry cells.

Note the fact that a potentiometer is used across the A battery of the first tube. This is necessary to the correct operation of the circuit and should not be omitted. It is not advisable to add more than a single stage of radio-frequency as it has been discovered that

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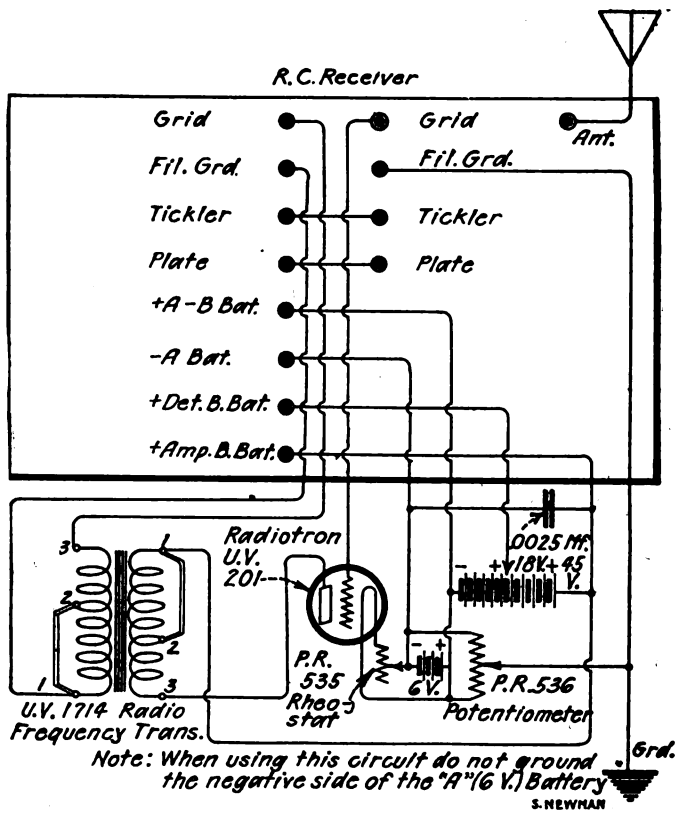

Showing how a stage of radio-frequency can be added to an RC or RA-DA combination without disturbing a single connection inside the set. All connections are made outside by means of flexible wire, or the unit can be made in a separate cabinet and wired as shown. Circuit diagrams supplied by Radio Corporation of America. (Fig. 1).

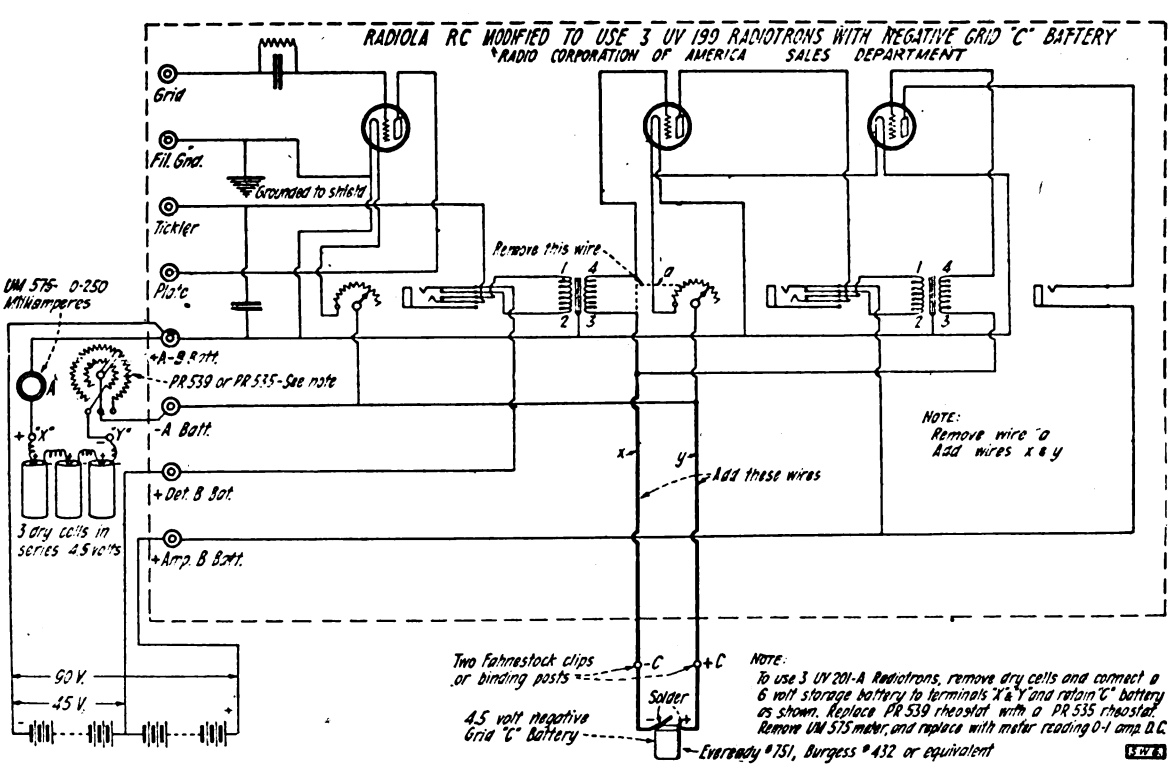
RADIOLA RC MODIFIED TO USE 3 UV 199 RADIOTRONS WITH NEGATIVE GRID "C" BATTERY
RADIO CORPORATION OF AMERICA SALES DEPARTMENT
Grid
Fil. Grd.
Grounded to shield
Tickler
Plate
Remove this wire
UM 516- 0-250 Milliamperes
+A-B Batt.
PR 539 or PR 535- See note
-A Batt.
+Det. B Bat.
+Amp. B Bat.
3 dry cells in series 4.5 volts
90 V.
45 V.
Two Fahnestock clips or binding posts
-C
+C
Solder
4.5 volt negative Grid "C" Battery
Eveready #751, Burgess #432 or equivalent
NOTE: Remove wire "a" Add wires x & y
Add these wires
NOTE: To use 3 UV 201-A Radiotrons, remove dry cells and connect a 6 volt storage battery to terminals "X" & "Y" and retain "C" battery as shown. Replace PR 539 rheostat with a PR 535 rheostat. Remove UM 515 meter and replace with meter reading 0-1 amp. D.C.
SW&S

Diagram showing how it is possible to place a "C" battery in the DA unit of the RC set by the addition of two wires and the severing of the wire that taps on the rheostat of the audio-frequency filament control. The addition of this simple battery will make absolutely distortionless amplification on two steps possible. Carefully insulate and solder all leads, and trace connection before inserting tubes and turning on current. (Fig. 2).

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the controls become so complicated that tuning with any degree of accuracy is almost impossible. For that reason only one stage is shown. Furthermore, as regeneration is used in combination with radio-frequency the set is perfectly capable of bringing in sufficiently distant stations to satisfy any except the fan who insists on hearing Los Angeles in New York.

Another handy hint that is sponsored by the Radio Corporation of America's engineers is the addition of a C battery in the grid circuit of the two stage amplifiers. It has been found that when working on two steps, or even one step, that there was some distortion due, of course, to a positive charge on the grid of the amplifier tube. In order to remove this, and give absolutely clear amplification free from distortion, a C battery was found absolutely necessary.

Any one can, with the help of a soldering iron, a little patience and a great deal of care in tracing the wires correctly add a C battery to this receiver in an hour's time. The battery may consist of a single dry cell battery such as used in the flat type flashlights, connected as shown in Fig. 2, and will last quite a long time, of course, depending upon the use that the amplifier is put to.

The use of the C battery will also conserve the A battery as it will not be necessary to burn the amplifiers up as high as before it was added. The diagram shows how by the addition of two wires, and the removal of one, the change can be accomplished.

Be sure that you have your connections right, however, before actually putting the set to use, as a wrong or crossed connection would cause trouble, and probably result in the blowing of two tubes should you have the set connected wrong.

With the addition of these two ideas it is possible to make your RC receiver a real long distance receiver capable of bringing in distant stations on your loud talker, with the minimum amount of labor and absolutely distortionless signals. As a further note it will be found that the radio-frequency signals will be clearest with a minimum amount of tickler in the circuit, but that, of course, will depend upon the operation of the set itself, and no fixed point can be recommended, but mention is made of it so that it can be used to advantage by any one who constructs the additional part and installs the necessary C battery.

Users of this type of receiver have doubtless noted the fact that when the tickler is turned down, it takes more current in the filament circuit to make the tube oscillate. If during the operation of the set, the tickler is turned down two or three taps, unless it is a local station, the signals will fade out. Now if the tickler inductance is turned down to the point at where the signals are just barely audible, and adjustment is made with the vernier until the signals are heard at their clearest and best, and the filament of the detector tube is turned up just slightly, it will be found that the signals are much louder and clearer than if they had been haphazardly tuned in.

Lighthouse Service Designs a Portable Receiving Set

By S. R. Winters

NOVICES and amateurs in the wireless game who may experience difficulty in hoisting antenna wires to tall trees, should profit from the experience of A. W. Tupper, assistant engineer of the Lighthouse Service, United States' Department of Commerce. At his residence in Washington, D. C., he selected an oak tree of big dimensions for supporting the antenna wires. The first limb on this tree was about thirty feet from the ground, a condition which made it well-nigh impossible to climb the tree.

Evidently recalling his boyhood days when a bow was employed in shooting an arrow to dizzy heights, he considered its use for sending the antenna wire over the 90-foot tree. Consequently, one end of an arrow was loaded with lead and then tied to a string and shot over the oak tree. His first attempts were unsuccessful, but after repeated trials he succeeded. The completed antenna was 100 feet long, 30 feet high at the lower end and 70 feet at the upper end.

This particular antenna serves the experimental purpose of the use of a model radio-telephone receiving set designed by the Lighthouse Service for the keepers of lighthouses along our 44,000 miles of coast line. A radio club has been formed in Washington, about 50 of its 60 members being keepers of lighthouses. As an outgrowth of this, the Washington office of the Lighthouse Service has prepared blueprints of a portable wireless receiving set.

This compact radio-telephone receiving outfit, which is equally as adaptable to the home as to the lighthouse, weighs only a little more than twelve pounds, including the cabinet, instruments, and batteries. Only one WD-11 vacuum tube is used. A dry-cell battery of 1½ volts lights the filament, and the plate circuit derives its electric energy from a 22-volt dry cell battery. Storage batteries are, therefore, dispensed with. The electric current consumed by this single vacuum tube in detecting and amplifying the wireless signals is almost negligible, the glow of the bulb being barely discernible.

Directions for building receiver as published by the Lighthouse Service using two spiderweb variometers, prescribe that the following apparatus as necessary:

1 WD-11 or other 1½ volt tube; 1 tube receptacle to fit tube; 1 pair of headphones; 1 22½ volt B battery; 1 dry cell; 1 23 or 43 plate variable condenser with vernier; 1 phone condenser, .0025 mfd.; 1 grid condenser, .0005 mfd.; 1 grid leak; 1 piece of fiber or hard bristol board about 1/32" thick and 8" square; ¼ pound No. 26 gauge enameled magnet wire; 1 rheostat for filament; 1 piece ¼" diameter dowel stock 5" long, 1 piece ½" diameter dowel stock 8¼" long; 7 feet tinned copper bus bar wire or heavy bell wire; 1 piece of tinfoil large enough to cover panel for shielding; 4 binding posts; 4 machine screws, No. 6, ½" long, with nuts; 1 piece brass 1/16" thick, ⅝" wide and 6" long for making end supports for coil shafts; 2 knobs and dials; 3 dozen copper wire terminals; 1 piece of bakelite, hard rubber, or perfectly dry, close grained wood for panel, size ¼"x13"x10¾".

The entire construction of this set is quite simple. The only difficulty likely to be experienced is in making proper connections with the spider-web coils. If the diagram is carefully followed, however, no serious

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trouble will be found. One important point must be borne in mind. Each pair of coils must be assembled so that when the coils are together and viewed from one side the wire in each will be turning in the same direction. It is well to mark each coil with an arrow near the center of both sides, indicating the direction in which the wire is turning in passing from the center of the coil to the outside or end. Then when you assemble the coils, arrange them so that the arrow on each pair of coils is pointing in the same direction. If this is not done, it will be rather hard to determine the direction once they are on the set. Leave a connection wire about eight inches long at the beginning and end of each coil.

The shafts which hold the movable coils are made of a wood dowel. These shafts pass through the front

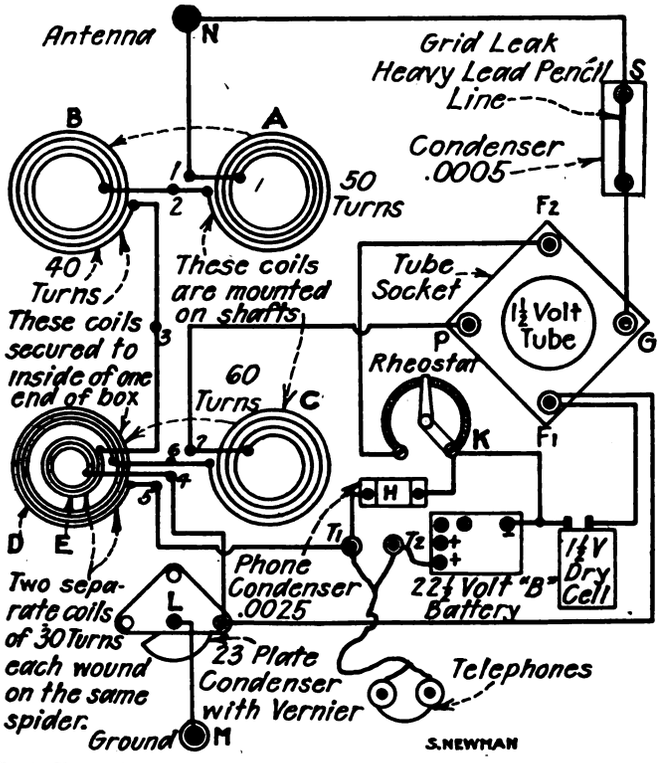

Fig. 1. Circuit diagram of lighthouse receiver using two spiderweb variometers. The figures 1 to 7 correspond with the numerals on the connection block shown in Fig. 2. Be sure to connect the rotary plates of the condenser L to the ground wire, to prevent capacity effect and howls.

panel and should be fitted with knobs on the front to permit manipulation of the coils. The rear end of the shaft should be sharpened to a cone-shaped point which will fit into a hole drilled in the spring brass elbow as shown in the drawing. This hole should be small enough to prevent the entire dowel passing through—⅛" is sufficient. The elbow should press with enough tension against the dowel to prevent the coils turning when in a horizontal position. The dowel is prevented from being pushed out of the front of the panel by either a screw collar, which can be made from a discarded spool, which holds it against the panel, or a pin passed through the dowel at the proper place.

The formers for the spider-web coils are cut from heavy cardboard. They are 4" outside diameter, the center being 1¼" diameter. Each has nine slots, giving an uneven number so that no two adjacent wires will cross on the same side of a given sector. After the wire is wound the entire coil should be given a coat of collodion, coil cement or thin white shellac, which is allowed to dry thoroughly. This is to prevent the wires working loose and to keep moisture out of the board. Four formers will be needed for the set, wound as directed on the diagram.

The cabinet for containing this compact radio-receiving set was built by the engineering construction division of the Lighthouse Service. It is made of common pine timber and is stained with a color resembling mahogany. The cabinet is covered with two coats of shellac. The panel board is made of seasoned oak, but rubber or bakelite may be used, being about 3/16" thick. The panel is first drilled and two coats of shellac applied if a wood panel is used. One coat of the latter is given to the holes in the panel, this application aiding in the prevention of moisture penetrating the wood. The back of the panel is covered with a sheet of tinfoil and the latter is grounded. The tinfoil was secured to the panel while the shellac was in a moist or soft condition. At points where the wireless instruments are attached to the panel the tinfoil is cut away as a means of avoiding electrical connections with the panel.

Since this portable radio-telephone receiving equipment is homemade, the cost of all the necessary parts will not exceed $20. The simplicity of adjustment and operation of this portable set are factors which recommend its widespread adoption in lighthouses and in rural communities where people may have only a limited knowledge of electricity. Six of these model

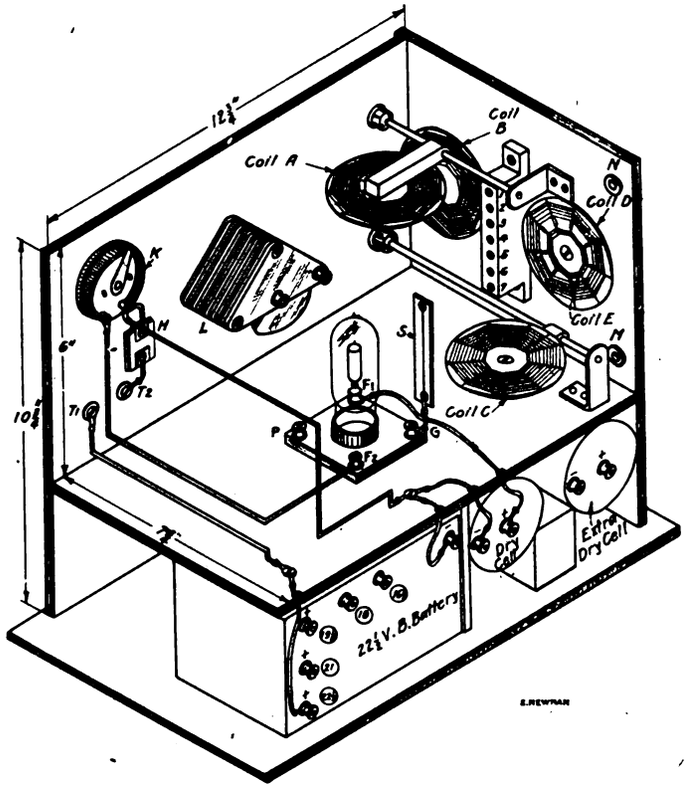

Fig. 2. Interior view of the completed lighthouse receiver with the filament circuit and B battery circuit wired to show the style to be followed. All other connections are made according to wiring diagram and brought to the connection block located between two stationary coils on inner right hand side. Numbers and letters in Fig. 1 correspond with lettering on the block to simplify connecting.

outfits have already been built by the Washington office of the Lighthouse Service, and their efficiency in the reception of radio communications has been sufficiently demonstrated. If atmospheric conditions are favorable, music and speech may be heard in Washington when emanating from Boston, Chicago, Detroit, Kansas City, Atlanta, Davenport, and occasionally Havana, Cuba. For instance, signals have been received in Washington from Buffalo with the rheostat placed at the extreme point of resistance.

The Lighthouse Service has written and published five pages of text outlining the details of this set.

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Navy the First Broadcaster

By Col. Theodore Roosevelt

Acting Secretary of the Navy

THE Navy started its experiments on radio about the time Marconi gave his first public demonstrations. More than twenty years ago a radio station was installed at the Navy Yard here in Washington. The flag pole of the commandant's house was used to support the antenna, and messages were sent from there to Annapolis, where a flag pole likewise was used to receive. After this, the development went by leaps and bounds.

Our first big radio station, built to communicate with the fleet, was the Arlington station. Like all other developments it took a considerable length of time to get under way. * * *

Long before radio telephone broadcasting became the order of the day, thousands of persons all over the country, as well as ships over the seven seas, received from it time signals and broadcasts. * * * * *

At the present day, radio telephony is considered the ordinary thing. I don't suppose there is a member in the audience tonight who knows that the first modern radio telephone broadcast was transmitted from our station at Arlington as long ago as 1915. This broadcasting has not been the result of one brilliant idea by some genius; it has been developed step by step through laborious investigation and experiment. In 1915 the radio messages broadcast by Arlington were picked up in Paris on the one hand and in Honolulu on the other. The success of the experiment largely contributed to the development of the science.

These are only a few striking instances of what the Navy has done for radio from day to day during the past 20 years. We have been selecting, testing, rejecting, and adopting devices in radio work. We cooperated with the General Electric Company in the organization of this Radio Corporation of America from whom this message is going. This is an American company financed by Americans and serving our country. At its head is a splendid American, General Harbord, whom I have known for years and am proud to call my friend.

In view of the close relationship between the Department and the Radio Corporation of America, the Radio Corporation has arranged to turn over to the Navy Department at least once a month its new broadcasting station. On these nights, experienced naval officers will tell the story of the Navy and our band will play for you. We are most anxious to do this, for we know that the more the people in the country understand what the Navy means to them, the stronger will be their support of it.

Abstract of an address made at the opening of Station WRC, Washington, D. C.

No Static Above 3,000 Feet, Balloonist Reports

By C. D. Wagoner

STATIC, that mysterious interference to the reception of radio signals which is perhaps one of the greatest puzzles to radio experts today, may be confined to an atmospheric belt about the earth. At least that is the possible conclusion reached in special tests made by Ralph Upson, one of the country's most prominent aircraft engineers who was a contestant in the national balloon race which started from Indianapolis last month.

Upson's balloon was equipped with a powerful lightweight radio set by the General Electric Company. For six weeks preceding the race Upson had used the set in his home and thereby became thoroughly familiar with its operation under various conditions. His experience had taught him what static sounded like and he also learned that the air seemed particularly filled with it when there was an electrical storm in the vicinity, so much so in fact that one of the uses he planned for his radio outfit in the race was to detect thunder storms before the lightning might be visible.

In his tentative report to the General Electric Company made after the race, Upson writes:

"One of the outstanding happenings in the use of radio in the balloon race was that at altitudes of 3,000 feet and above we observed absolutely no static whatever, although we could see lightning at various points on the horizon."

Upson's chief purpose of carrying radio was to help him win the race. Five of the principal broadcast stations had arranged to send out special weather reports on upper air currents during the first night of the race and the following morning. In regard to this Upson says:

"Andrus, my aide, acted as chief radio operator. He began listening in at 8:30 o'clock the night of the race. At first he could hear nothing but code signals, concerts from various stations and a radio drama that was being sent from a Chicago station. For an hour this was about all we could hear. Then at 9:45 o'clock, Central time, Andrus picked up the latter part of the weather report being broadcast from WGY in Schenectady. We heard just enough of it to make us wish we had heard the entire report. However, our disappointment was short for a few moments later the whole report was repeated, every word being received clear and distinct. It was just the news we wanted.

"As a result of the information, we decided to go a little higher but not to try any high altitudes unless forced to it by thunder storms. The report gave us full confidence of reaching New York State and possibly New England. Everything seemed so favorable that I turned in to sleep, leaving the balloon appendix partially closed. Then came the accident and you know the rest, a forced landing."

Omit the Condensers

A LOT of trouble in summer time receiving is caused by the use of series condensers in the antenna and ground circuit of the receiver. Do not use them unless it is absolutely necessary. They collect atmospheric charges and cause louder and more clicks and bangs.

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A Portable Set for the Hike

By Kenneth Malcolm, A. I. R. E.

THE portable set to be described is very small and light of weight; and yet it is not a freak set as many small sets are, but employs a standard circuit that, within its limits, will give very good results.

It is trusted that all good bugs have a fair idea about radio, and are somewhat familiar with the apparatus used and its construction. So, therefore, only an outline will be given—leaving the drawings to do the rest. The measurements are only suggestive, and need not be strictly adhered to, except in the case of the number of turns on coils and the capacity of the condenser.

The apparatus needed includes a .0005 mfd. variable condenser of one of the new flat types having a mica dielectric; two fibre disks about 1/32 inch thick and 3½ inches in diameter; 40 feet of No. 22 single cotton-covered wire, and 70 feet of No. 24; a rotary switch

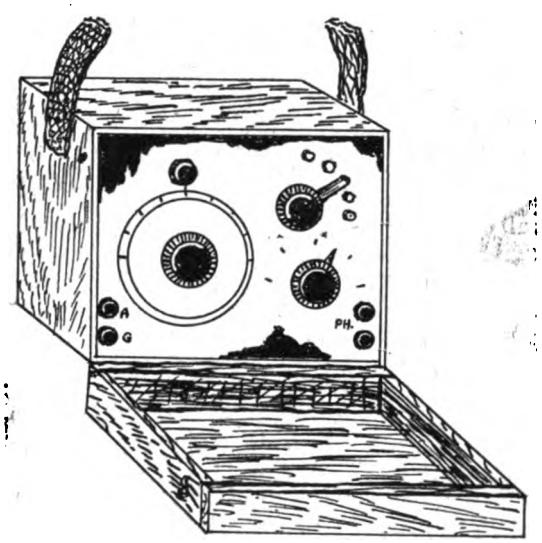

Fig. 1. View of the portable tube receiver as it should appear when completed.

arm and five contact points; a vacuum tube and socket; rheostat; grid leak and grid condenser; four binding posts; a short length of 1/16-inch brass strip and ⅛-inch round brass rod; a panel and cabinet; a small insulating knob; and the necessary aerial wire, batteries and phones.

The inside dimensions of the cabinet should be six inches wide, four inches deep, and five inches high. The hinged cover should have an inside depth sufficient to allow for the height of the knobs and dials. A panel of bakelite or some other good insulating substance about 3/16 inch thick, and a size that will fit the front of the cabinet, should be secured.

There are on the market several .0005 mfd. tuning condensers that have a mica dielectric and are very thin that would do very well for this set. However, a standard condenser may be used if the depth of the cabinet is increased. The mounting of the instruments on the panel should be done as the drawings show—the condenser on the left side, and the rheostat and the switch on the right. A little hole is drilled directly over the condenser dial, through which a ⅛-inch rod will pass freely.

The tube to be used depends upon your individual taste, though for a portable set the dry cell type is the only one that is practical. The WD-11 that operates on a single dry cell, and the UV-199 that will operate on a three cell flashlight battery, are both very suitable. The first mentioned tube requires a rheostat having a resistance of about six ohms, and the latter a rheostat of about 30 ohms.

The grid condenser should have a capacity somewhere between .00025 and .0005 mfds, and should pref-

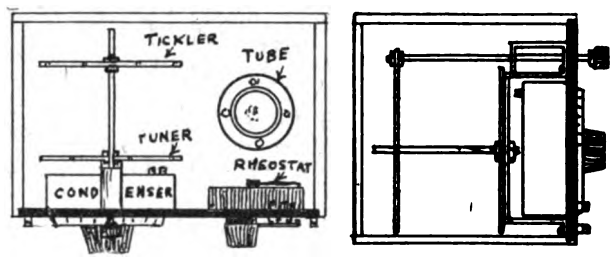

Fig. 2. Top and side views of the set showing the location of the various units and parts.

erably be of the mica dielectric type. The grid leak should best be variable, unless you have a number of different sizes that you could first experiment with, to find the correct resistance.

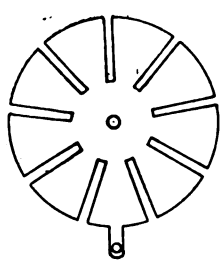

Fig. 3. Details of the spiderweb former used as an inductance.

Next, the coils may be made. Each disk should be cut with slits about ⅛-inch wide, so that there will be nine "wings" on each. In the center of each disk should be drilled a ⅛-inch hole, and one disk should have a projecting lug left on one of the "wings," about a half inch long, and drilled near its end with a ⅛-inch hole. This disk with the lug should be wound spiderweb fashion with 75 turns of the No. 24 wire; that is, the wire should be passed over one wing and under the next, and so on. The other disk should be wound by the same method with 45 turns of the No. 22 wire. This latter coil acts as the tuning inductance and the first coil as a tickler, for the purpose of regeneration, or for the receiving of C. W.

The coil used for tuning may be mounted on the back of the panel by means of a strip of brass, bent as

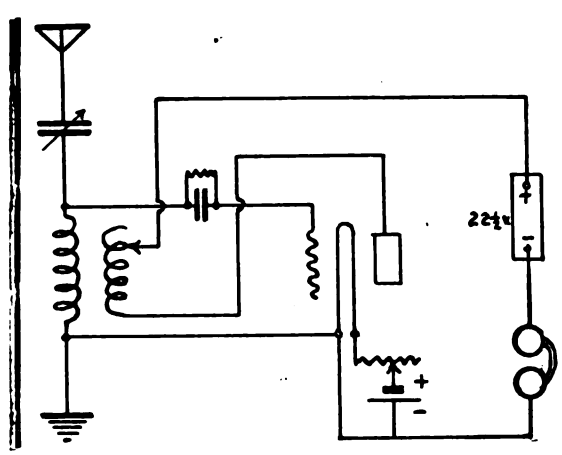

Fig. 4. Circuit diagram of the portable receiver. It is the conventional single circuit diagram. Care should be taken in the construction if success is desired, paying particular attention to the polarity of the battery leads.

shown. It will be observed that the upper end of the strip is bent up, back and down again, to form a sort of a bearing for the tickler adjusting rod. A length of

(*Concluded on next page*)

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Amateurs Relay Naval Radio Messages

SPRINGFIELD, MASS.—Radio amateurs residing in this city are giving their services voluntarily in the First Naval District by relaying official messages requiring prompt attention, between the Reserve Division here and the Brigade Headquarters at Boston. Commander J. T. Nelson, in a recent letter addressed to Ensign H. F. Johnson, of Springfield, commended this work in these terms:

"The work of your division in training men for radio operators is greatly appreciated and your division is the only unit where training of this nature is being carried on. It is the brigade commander's wish that you continue this work and expand this radio department if it can be done without detracting from the general training of your division."

This practice under service conditions is valuable.

Concerning Plate Batteries

THOSE amateurs using dry cell tubes should be glad to get a little information relating to them and the dry cells used for their operation. It is always a good plan to use two dry cells in parallel for every tube used, by so doing the life of the batteries will seem to be everlasting because of the fact that they really do last so long. Six dry cells have operated a three tube set for nearly 7 months and are just now beginning to show a voltage drop after they are in use about 30 minutes in the evening. Which is cheaper, buying six dry cells now and having them last seven or eight months or buying three and having them last one or two?

Important Future for Radio Compass

POSITION finding by wireless is destined to be one of the most important navigational aids of the future, whether employed alone or in conjunction with sound to obtain synchronous signals, according to D. W. Hood, M. Inst., C. E., engineer in chief to the Corporation of Trinity House, London, who was among those present at the International Congress of Navigation, held in London last month. George R. Putnam, Commissioner of Lighthouses, was among the American delegates to the convention, which was declared to be the most important meeting of the kind ever held.

In his report, Mr. Hood referred to the fact that various countries have different direction-finding systems of their own, and recommended that an investigation be made to find the most effective method, not by individual countries but by one agency under an international agreement.

The establishment of radio fog signals was the most important advance in lighthouse work in the United States during the past ten years, according to a paper read at the conference by Commissioner Putnam. The first of these signals were placed in service on May 1, 1921, when three were put into commission in the vicinity of New York harbor. The number of such stations has been increased during the past year.

Each of the radio fog stations in United States waters sends automatically during fog or low visibility radio signals on a wave length of 1,000 meters, with a distinctive characteristic, which are used by vessels equipped with radio compasses. Very reliable results are being obtained, Mr. Putnam declared.

(*Concluded from preceding page*)

the brass rod is cut, sufficient to reach from the tuning coil to the back of the cabinet. This is threaded at one end, and fastened securely to the tuning coil by means of nuts and washers. The other end is left free. Another length of rod is cut, sufficient to reach from the face of the panel to the back of the cabinet. Both ends of this are threaded for a short distance, and on the end that projects through the panel the small knob is fitted. After the tickler coil has been slipped over the center rod, the other end is fastened with nuts to the lug on the tickler. This allows the coupling between the two coils to be easily varied.

The tickler should be tapped at 55, 60, 65, 70 and 75 turns, and flexible leads should be carried over to the five switch points on the panel. The remainder of the wiring should be done with rather stiff wire, and it is imperative that all joints be soldered. The tube is mounted either on the base of the cabinet, or upon a sub-base attached to the panel—the latter is more satisfactory. The A and B battery leads may be brought to binding posts, or the batteries may be included in the cabinet by increasing its size. The aerial and ground binding posts are mounted in the lower left hand corner of the panel, and the phone posts on the lower right.

The aerial for the hiker could best be of flexible insulated lamp-cord, in a hundred foot length. A stone could be attached to end of this and flung over the limb of a tree. A ground is more difficult to get in the open, but might consist of a counterpoise of a wire similar to the aerial wire strung out on the ground, or a long length of wire thrown in a lake, or buried in the bed of a stream. Old pumps and wire fences sometimes make good grounds. If it is large enough, the aerial and ground wires might be coiled inside of the cover when carrying.

To operate the set, begin by turning on the rheostat to some arbitrary point; next adjust the variable condenser until a station is heard; then vary the tickler coupling and adjust the switch until maximum response is obtained; a re-adjustment of the rheostat will now give the best results.

If a strap of leather or webbing is attached to the cabinet, it may be carried about as easily as a canteen of water.

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The Radio Woman

SEVERAL of our friends who had not succumbed to the radio fever had been coming to our club every Thursday evening. It used to be that our Thursday nights were bridge nights, then Pung Chow, but both have been relegated to the things of the past. In their place we now have a "Radio Fest." That is, we used to have but one by one, the outsiders were prevailed upon to buy sets, and the recent sales by department stores of real sets at small prices have stolen most of our "club" from us. But just the same, we take great pleasure in comparing the working of our different sets on different nights, and F. H. says that going down to business in the morning, even the conventional poker or pinochle game has been stopped in order to compare notes on the evening before reception. "I am sure that if radio has done nothing else, it has developed more liars than golf ever did. Jack can be relied upon to keep quiet until everyone has told of his performances, and then he brings out a slip that he supposedly copied the night before and stops us all. Some of these nights I am going to drop in unexpectedly, when I know his storage battery is charged and everything including static is favorable to distance, and see just what he does or says when he has a witness."

Well, I believe that a little stretching now and then keeps the interest up, inasmuch as it makes the other fellows sceptical, and then again radio reception is such a freaky thing that anything is possible, even KYW on a crystal.

* * *

Which, by the way, reminds me that I received a letter from a little girl out in Wyoming addressed to me at RADIO WORLD, and wanting to know if I thought that it was in my opinion wrong for a little girl to "play with big brother's radio." It seems that she has become quite a fan and, of course, quite adept at the manipulation of Bob's radio set, but that he disapproved of it and kept telling her to "Keep your hands off, and play with your dolls." She asks me if I think that it is wrong for her to "listen in" if she knows how to work the set.

Well, Mae dear, all I can say is that I think that Bob is very selfish. I should think he would be glad to let you show that you are able to operate such an intricate mechanism as a four tube set. Girls these days are not the little wall flowers and feminine frailties that they used to be considered, and you just tell Bob that both F. H. and myself think that he is selfish.

* * *

Another thing that must be of interest to fans is this. I have noticed on several of the cooler days that reception during the early part of the evening will be remarkable. No static, or any other phenomenon. Even WGY will not fade quite as often or as much as usual. Then suddenly around 11 or 12 o'clock, static will start to rumble and crack and spit, and stations will start to fade in and out with unseeming regularity. And nine times out of ten, the next day will be a bright, sunshiny warm day. I have noticed this for some time, and one fact especially is that on an evening when there was a lot of static, there were generally clouds in the sky, and the next morning the sky would be absolutely cloudless.

Watch these little things, and then you will begin to wonder. I have a faint suspicion that the clouds moving through the air have some bearing upon the static, but, of course, I am not up on it as a radio engineer, but I am entitled to my opinion, and now you have it.

WCAP Does Stunts

NEW radio history is being made daily by the Chesapeake & Potomac Telephone Station (WCAP) in Washington, D. C. As yet, no local programs have been put out by this station, which has confined itself to the broadcasting of the programs of WEAF, New York, received in Washington over a special land line, and there "put on the air." However, the Washington station made arrangements whereby the concerts of the famous Marine Band were picked up at whatever point the band was located by means of a special automobile truck, equipped with microphones, controls, etc., from which the music was sent to the transmitting station by tapping in on the nearest telephone cable.

So successful did this method of pick-up prove that concerts by the Marine Band were sent to New York over the line usually used for the reception in Washington of New York entertainment, and broadcast by WEAF. The same system was followed when the memorial services held in Washington churches for the late President Harding were broadcast both from WCAP in Washington and WEAF in New York. The truck used by WCAP has practically all the equipment of a Class B station.

Mrs. Coolidge Has Her Own Private Radio Set

(C. Underwood and Underwood)

Mrs. Calvin Coolidge, wife of the President of the United States, enjoying a few spare moments listening in on her private radio set. Mrs. Coolidge is a keen follower of radio, and is well versed in its possibilities. Radio has interest for everybody that is interested in life, because over it one may hear classical music, interesting talks—in fact anything and everything that is of value to the men and women of today. That is why it appeals to "the first lady of the land."

"Save the Juice!"

THIS is an expression used in the studios where they make motion pictures whenever they have finished taking a scene and the huge arc and Cooper-Hewitts are not needed. It can be used successfully by the average radio fan. It is not necessary to use the loud speaker for local work when you are just entertaining yourself or two or three other people. Use your phones on the detector and get better and clearer reception—and "save the juice!"

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President Harding Was a Good Friend of Radio

By Carl H. Butman

WASHINGTON, D. C.—The important part played in our daily life by radio was forcibly impressed upon the public when, following the death of President Harding, a majority of the broadcasting stations throughout the country closed down for varying periods as a mark of respect.

The almost complete cessation of broadcasting brought home as could nothing else the important niche which radio has carved out for itself in our daily routine in the past two years. People in all walks of life commented upon the gap in their evenings, which they found hard to fill, and while practically all agreed that it was but fitting that the broadcasting of entertainment should temporarily halt while the country sorrowed, probably nothing else connected with the final honoring of our dead President made as deep an impression.

In the death of President Harding, radio lost a good friend. He was one of the first officials of the Government to turn radio fan when, following the first radio conference in 1922, the attention of the country was turned toward the new method of entertainment. The set built for his use in the White House was the last word in reception but, while he liked to "play" with it, he had but little time to devote to amusement and found himself for a long time unable to cope with the interference which prevailed when there was but one wave length for broadcasting.

In many ways the President evinced his interest in radio. He gladly accepted the invitation extended to him by the National Press Club of Washington to attend the exercises incident to the "christening" of its receiving set, and while the music and speeches which were to have been broadcast from a nearby government station especially for the occasion failed to "come through" the President "stuck around" like the "good fellow" he always was, chatted with the members of the club—which is composed of newspaper men—and made them a little talk on the difficulties of being President which gave them much inside dope on the great task which confronts the nation's Chief Executive from day to day.

While the failure of Congress to pass the White Radio Bill kept radio from becoming an official subject of consideration at the White House, Mr. Harding frequently expressed his interest in the matter and the hope that legislation could be enacted to eliminate interference, give the amateurs the privileges they desired and which he thought they were entitled to, and put radio on a concrete foundation.

President Harding was radio's friend, and the silencing of the broadcasting stations of the country was but a fitting mark of respect to a man who laid down his life for his country as surely as if he had died on the field of battle. No finer tribute could have been paid than the silencing of more than 500 stations, quiet while the country ceased its activities and a hundred million people mourned.

Radio Serves in Peace and War

By Major General John L. Hines

Deputy Chief of Staff, United States Army

THE progress of civilization depends, in a material sense, upon the advances made in the technique of transportation and communication. These are the links which bind us into a social organization. This station alone will have a great influence in maintaining social unity in America in the face of the disintegrating effect of the rapidity with which we are beginning to move and to live. Its facilities will be a tremendous factor in commerce and industry. * * * All of this makes it apparent that such an undertaking is not a private concern but rather a public utility in the widest sense of application. Lending itself to the improvement of our unity, during peace time, it is equally suited to protect that unity and the public interest when our peace is threatened. * * * * *

It is comforting to realize that in any future eventuality we would have the use of such agencies as this station. It is not too much to say that these facilities would bring the people of our great country as closely under common guidance as were the Minute Men of Lexington when they were mustered by the single efforts of Paul Revere. * * * * *

Typical of good Americanism is this action of the Radio Corporation of America in opening for public use an implement which it intends and hopes will be used for peaceful progress but which it would gladly turn over to our country for use in resisting wrongful aggression against our rights or our ideals.

I believe that many thousands of Americans will receive enjoyment from this agency. I trust that it will add to our great progress in civilization and that it need never be used to marshal our forces for defense. Above all, however, I hope that it will serve as an additional bond to strengthen that spiritual Americanism that is one of the most potent forces for good in the world today. * * *

Abstract of an address made at the opening of Station WRC, Washington, D. C.

Not Necessary—But Handy

VERY few of the home constructed sets have more apparatus than is actually necessary for the reception of signals. However, an added refinement, and one that will prove a valuable asset to the operator once he gets on to the hang of its use, is a plate milliameter. Many times a set will function fine one night and suddenly the very next night be "out" and you go hunting for trouble where there is none. If you include a small plate milliameter in the set (it doesn't have to be an expensive one) you can have an accurate check on your battery by means of its variations. Some interesting facts will be noted also on the amount of current passing through the plate circuit in different distance work. Some stations will pass as much current as .5, while some locals, though much louder, will only pass .6.

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California High School Installs Sending and Receiving Radio Station

By Charles Geiger

THE firm hold which radio has taken upon the people has made it necessary that instruction in this art be given in a complete manner, and in order that the instruction at the Piedmont High School in Oakland, California, should be properly demonstrated, the Board of Education has installed a radio sending and receiving set. This is complete in every detail and is unique in the fact that it is mounted entirely in an ordinary office desk.

To the right of the desk, and let into the top, is the amplifier. The center drawer and the drawers in the right hand leg of the desk are left intact for the storage of the apparatus and spare parts for the radio set and for instruction material, while the left leg has been converted into two compartments. The door to the left front is arranged to resemble the drawers, so that the general appearance of the desk is not disturbed. In the front compartment is mounted the motor-generator for supplying the plate voltage to the sending part of the set, and there is also mounted in this compartment the switchboard controlling the charging and discharging of the storage batteries. The second compartment, directly behind the first, entrance to which is by means of a door on the left hand side of the desk, is lead lined, and in this are placed the storage batteries.

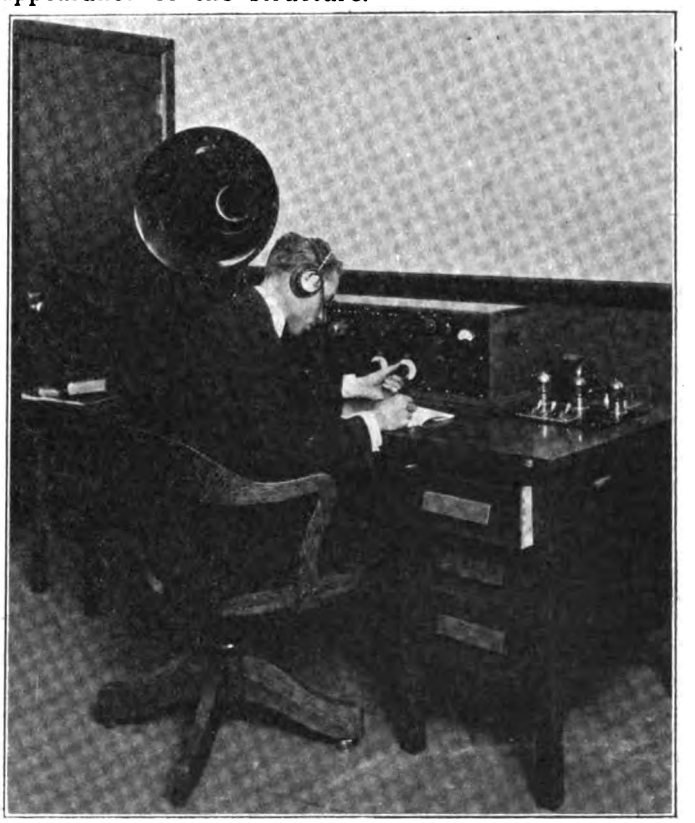
Mounted on top at the right of the cabinet, is the chopper, used in sending code or telegraph signals. The sending key is portable and mounted on an insulating base with long, flexible leads, so that it may be placed at the convenience of the operator or student. The set embraces a fully equipped receiving set for reception of all kinds up to 600 meters; it includes a small broadcasting station on which both voice and music may be sent by radio telephone; it has the key and equipment for sending by code; it has the three types of tubes—detector, amplifier, and transmitter—and therefore provides equipment complete for instruction in the art of radio.

The wiring is all concealed and presents a compact, neat appearance. The current supply is brought from the main switchboard of the school directly to the convenience outlet in the chairboard of the radio room.

Another unique feature of this installation is its equipment of standard convenience outlets, which are placed along the back and let into the top of the desk. The two on top are the connections for the Magnavox and permit it to be placed at any desired distance in the room or the adjacent room. The other convenience outlets are for the direct current battery terminal, the alternating current terminal to the rectifier for the charging of the storage battery, the ground connection and the alternating current mains used for the operation of the motor-generator and the chopper.

The recharging equipment is located in the closet just off the radio room, so that the noise and vibration will not disturb the receiving or transmission of messages. In addition, it is mounted on thick cork to in a measure deaden the sound.

The antenna is located on the roof and is so arranged that the artistic trimming of the building masks it from view. One pole extends only ten feet above the roof, and it is set into a socket composed of a piece of 8" steel pipe securely fastened to the concrete structure and guyed against movement in any direction. This socket provides a means of effectually making water-tight the opening through the roof, and also securely holding the pole in place. The other pole is secured in the corner of the concrete structure in the rear of the building. Both poles are turned and artistically capped. They are painted the same color as the building, and add to rather than mar the general appearance of the structure.



Radio sending and receiving set designed and built for the Piedmont High School. The apparatus is installed in an ordinary office desk.

The set and installation were made by the engineers of the Atlantic-Pacific Radio Supplies Company, Inc., of San Francisco, under specifications from the office of W. H. Weeks, architect for the Board of Education of the Piedmont High School, Oakland.

Another installation is a method of communication between the superintendent's office and each of the class rooms. This is designed and manufactured by the Magnavox Company and is known as the "general announcing system." There is installed in each room a "telemegafone," of which a duplicate is located in the superintendent's office. A selector panel provides a control arrangement by means of which the superintendent may at will talk to any one room or to any number of rooms.

An additional installation entirely new and unique is the combination of this announcing system with the radio receiving equipment. A special line has been run from the radio receiving set in the radio room and connected to the selector panel, by means of which the superintendent is enabled to divert the radio messages into any particular room or into any group of rooms which he may select. The arrangement is such that it is possible to have the "telemegafone" in any one room or every room working by radio at the same time.

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Uses and Abuses of the Dry Cell

By Velma Carson

ABOUT the time the farmer radio fan has invited some of the neighbors in to hear the fight returns and the lecture by Bryan, he finds that he can't tune in. Or if he tunes in at all, he gets a noise that sounds like a mouse whispering. The old thing simply won't show off. And he feels like the mother who has asked her precocious youngster to play "Humoresque" while the Ladies' Aid is meeting with her and never even gets the wretched, sulky child out from behind the door.

He explains apologetically that the battery must be worn out. Before he can get to town to have it recharged, the fight returns are in the newspapers and Bryan has traveled 900 miles to the next audience. The battery slips up on him this way about once every two months. In three years, beyond all coaxing, it gives its last, and dies a natural death. In the meantime, he has given it about $36 worth of rejuvenation which, added to the original price of $15, makes a total of $51. This does not include the loss, possibly, of a piece of the living room carpet eaten up by some spilled acid.

A dry cell either performs or it doesn't. If it doesn t, all the farmer has to do is to take it to the door and throw it as far as he can, and reach in to a reserve supply of them and get out another. You buy them like you do cigars. The dry cells cost 35 cents each, last for a hundred hours, and will keep unused in good condition for more than six months. For $51 one can purchase a ten years' supply. There is nothing in them that could possibly spill. They are what they say they are—dry cells. The dry cell can be carried around in a coat pocket, being only 2½" in diameter and 6" high. It is the only kind to use if the receiving outfit is to be taken on trips or carried from one room to another.

But there are several important things to remember in connection with the use of dry cells. One of them is not to burn the filament out by using the set continuously. Luckily, though, the broadcasting stations never accommodate such a desire. Just so the listener does not forget to turn the set off when the concert is over, this is not likely to happen. And it is important to not run more than one tube from one cell. If you have two tubes, use two cells in parallel. When possible use two cells in parallel to supply one tube. One point to be remembered when connecting cells in parallel is not to use an old and a new cell. Their voltages will be different and will set up local circulating current which will soon spoil the new one and will not improve the old one.

Safeguard Your Set

HOW many of you owning receivers have neglected to install lightning protectors? Do not run any chances with fate or lightning by neglecting this little item. It is only one chance in several million that it will ever be called upon to protect your set—but it's no use to lock the barn door after the horse is stolen.

More Broadcasters

DURING the past week three more broadcasting stations were licensed by the Department, as follows:

Call	Station	Class	Frequency Kcys	Wave Lgth Meters	Power Watts
KFJK	Delano Radio & Elect. Co., Bristow, Okla.	"A"	1290	233	100
WTAF	Gallo, Louis J., New Orleans, La.	"A"	1240	242	20
KFBC	Nielson Radio Supply Co., Phoenix, Ariz.	"A"	1260	238	10

List of Limited Commercial or Broadcasting Stations Deleted During the Month of July, 1923.

Call	
	Class "A"
W R A N	Black Hawk Electrical Co., Waterloo, Iowa.
K F A T	Donohue, Dr. J. T., Eugene, Ore.
W A B A	Lake Forest College, Lake Forest, Ill.
K F I C	Laskowitz, Philip, Denver, Colorado
K F J B	Marshall Elect. Co., Marshalltown, Iowa
	Class "C"
W Q A J	Ann Arbor Times-News, Ann Arbor, Mich.
W Q A K	Appel-Higley Electric Co., Dubuque, Iowa
W M A D	Atchison County Mail, Rockport, Mo.
K F D F	Casper Community Radio Corp., Casper, Wyo.
W I Z	Cino Radio Mfg. Co., The, Cincinnati, Ohio
W C A Z	Compton, Robt. E. & Carthage College, Carthage, Ill.
W P I	Electric Supply Co., Clearfield, Pa.
W P A S	J & M Electric Co., Amsterdam, N. Y.
W T P	McBride, George M., Bay City, Mich.
W A A Q	New England Motor Sales Co., Greenwich, Conn.
W I A V	New York Radio Laboratories, Binghamton, N. Y.
W N A B	Park City Daily News, Bowling Green, Ky.
W G A X	Radio Elect. Co., Washington C. H., Ohio
W F A G	Radio Engineering Lab., Waterford, N. Y.
W Q A T	Radio Equipment Corp., Richmond, Va.
W I A W	Saginaw Radio & Elect. Co., Saginaw, Mich.
W S A A	Sprague, B. S., Elect. Co., Marietta, Ohio
W M A W	Wahpeton Elect. Co., Wahpeton, N. D.
W N O	Wireless Telephone Co. of Hudson County, Jersey City, N. J.
W J A J	Y. M. C. A., Dayton, Ohio

Changes in Licenses

One new broadcaster and six transfers from Class C to Class A have been announced by the Department of Commerce, all in the western half of the country. The new broadcasting station is that of the Hardsocg Manufacturing Co., Ottumwa, Iowa, which has been given the call KFJL. This is a Class A station, having a wave length of 242 meters (frequency, 1240 kilocycles), of ten watts power. The recent transfers from Class C to Class A are as follows:

Call	Station	Class	Frequency Kcys.	Wave L'gth Meters	Power, Watts
K F C B	Azbill, W. K., San Diego, Calif.	A	1080	278	20
K F C K	Colorado Springs Radio Co., Colo. Springs, Col.	A	1240	242	10
K F B K	Kimball Upson Co., Sacramento, Cal.	A	1060	283	100
K F A W	Radio Den, Santa Ana, Calif.	"A"	1070	280	10
K N V	Radio Sup. Co. of Calif., Los Angeles, Calif.	"A"	1170	256	20
K D P T	Southern Electrical Co., San Diego, Calif.	"A"	1230	244	50

Think This Over

MANUFACTURED sets are made by experts. Therefore, if anything should go wrong with your set, unless you are accustomed to fixing it, it is best to take it to the manufacturer or the manufacturer's agent and let him analyze the trouble.

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Another "Neutro-Generative" Circuit

By C. White, Consulting Engineer

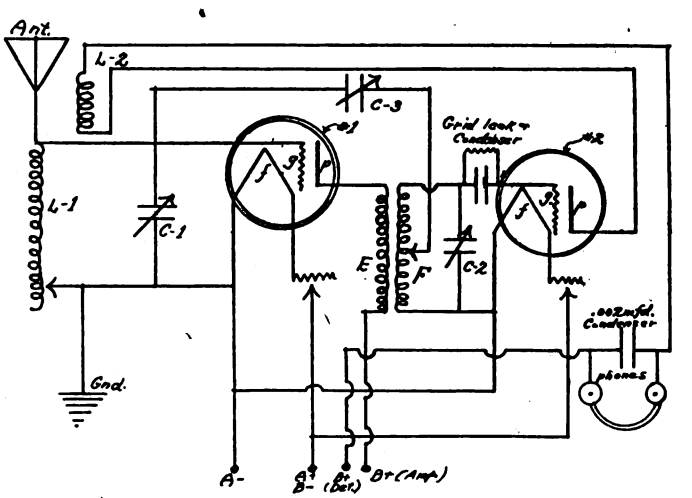
IN every radio fan there is the instinct and initiative to try the new. We are never satisfied fully with what we already have, and it is very good for us that we are not, because it is that spirit of perpetual search for something better that always leads to something better. Yet we are not all fully equipped to carry on a large amount of experimental work even if we should find the time. New circuits often mean new parts and apparatus which means more money to be spent. But it is often possible to try out a new circuit by using most of the apparatus already on hand. Nearly every radio amateur has a good variocoupler, several condensers and miscellaneous other tube accessories; hence, if he can only arrange what he already possesses and purchase just a few new items he is readily in a position to experiment. There is hardly a man who has a radio set that is not eager to try out some of the underlying principles of the "neutrodyne" in connection with his present regenerative receiver. Excellent results are easily obtainable for those who have the patience to fuss around the circuit until they get it balanced and working in good order.

The circuit illustrated is nothing more than a simplification of a previous "neutro-generative" circuit. (See RADIO WORLD, August 18, 1923.) It has been expressly designed for those who do not feel inclined to go to the extra expense to purchase choke coils, telephone size condensers, and extra potentiometers. In brief, it is a hook-up for the man who wants to try out first without heavy expense. Of course the previous "neutro-generative" receiver is the better one owing to the fact that more controls afford easier and more flexible stabilizing adjustments, but this receiver will operate satisfactorily just the same and afterwards the extra controls can be added. Audio-frequency amplification can be added to this receiver, if it is so desired, to increase the volume for the use of loud speakers. The stage of radio-frequency will not increase the volume of local stations very much over the volume obtainable with the detector tube alone, but it will enable a large number of relatively distant stations to be brought in with the same volume as the local stations, and quite a number of very distant stations that were never heard before.

In order to keep down noise it is advised that a very short aerial be used. This not only means less static, but also far better selectivity between stations. I firmly believe that many amateur aerials are entirely too long and act as wonderful static collectors in the warm weather. Try shortening your aerial a little and notice the difference in static as well as signal strength. There is a certain balancing point in length where the best possible signal volume and clarity is obtained.

The constants for the circuit are as follows: The unit L-1 and L-2 is an ordinary variocoupler using the coil L-2 as the rotor, C-1 and C-2 are each 11 plate condensers, but if you have on hand two 23 plate condensers they can be used instead of purchasing new ones. The condenser C-3 is a *very small* two plate vernier used as a stabilizing condenser which controls oscillation and by its proper adjustment oscillation can be avoided over the entire wave range of the set. The unit E-F is the only special thing about the circuit. The coil E is wound with No. 22 S. C. C. magnet wire on 3½" tubing, having 60 turns in all. The coil F is similar, only being wound on 4" tubing and tapped for switch points at each tenth turn. In the complete assembly of the unit E-F the coil E is placed inside of the coil F, thus rigidly fixing the coupling. If you fail to obtain an increase in volume as the coupling between L-1 and L-2 is increased, reverse the terminal connections to the coil L-2. Body capacity will give little or no trouble if the condensers are connected in as advised. The fixed plates of the condenser C-1 and C-3 are to be placed nearest the grid of tube No. 1, and the fixed plates of C-2 are attached to the grid side of F. In this way grid potential is removed from the shaft or movable plates of the tuning condensers and there is no howl as the hands are brought near the capacities for adjustment. To further cut down the little body capacity effect that remains, a small circular sheet of copper foil can be attached to the panel in front of each condenser. These shields should be connected to the ground terminal of the outfit. It is foolish to use too much copper foil for it would be of no particular avail.

Try this circuit if you can because it requires only one special part, the coil E-F, which can be easily made at home, and you will find you have a set that will operate on an extremely short aerial, thus making a small indoor or portable aerial feasible.



Simplification of the "neutro-generative" circuit described by Mr. White in RADIO WORLD for August 18, 1923.

Do You Yell?

WHEN talking to a friend over the telephone, do you yell? Then why burn your tubes up to their maximum when receiving? By doing this you are producing innumerable troubles for your neighbors and consequently causing them to bless you in no uncertain language—and you are not getting anything more out of your set than you would if you lowered the voltage and tuned your set properly. It is a mark of "amateurishness" to burn your tubes as brightly as they will, and it is also a blessing to the other fellows who are just as interested in radio as you are, when you shut off for the night. Conserve your tubes, their tempers and your signals by learning how to get maximum signals by the use of minimum filament current.

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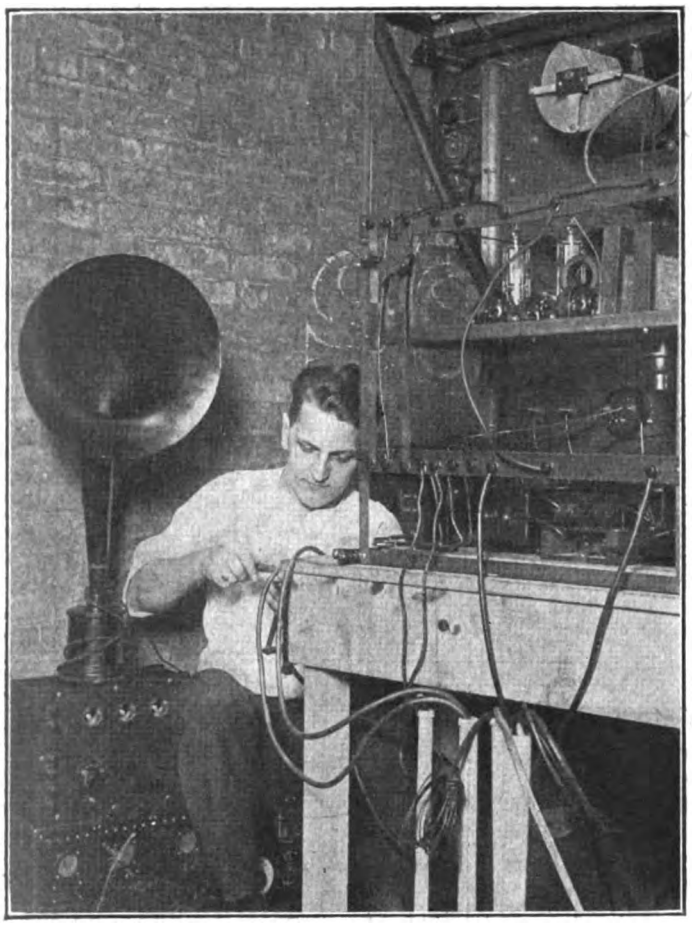
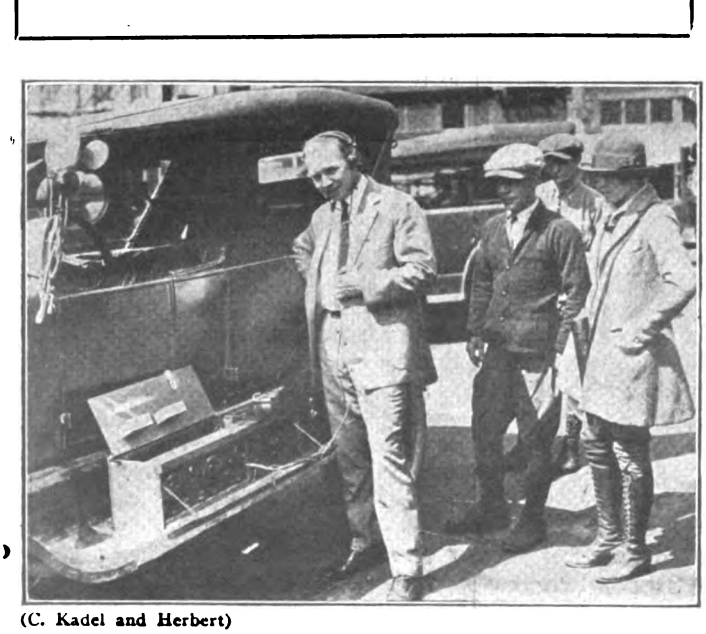
Our News Photographers Ke



(C. Kadel and Herbert)

Here you are fans, the new home of WHN, the Ridgewood, N. Y., station that was so popular with the local listeners last Spring. It has moved over to Loew's State Theatre Building, 45th Street and Broadway, New York City, and is run by the Loew Theatre Enterprises. F. W. Boettcher, operator, is seen installing the transmitter and endeavoring to look as though he liked to work in close quarters.

Captions by
Robert L. Dougherty



(C. Kadel and Herbert)

Frank H. Cromwell, Mayor of Kansas City, the "Home of the Nighthawks," is the first mayor to broadcast weekly talks concerning municipal affairs as a means of civic education. Mayor Cromwell is shown inspecting the "radio car," an automobile that is making a 'round the world trip. So far it has traveled 3,000 miles without breaking a tube.

U.S. Army Officers Testi

(C. Kadel and Herbert)

The 212th Anti-Aircraft Artillery, Radio Division of the Signal Corps, testin
ble radio receiver and transmitter. They are transmitting and receiving m
ascertain the efficiency of the French short wave receiver and transmitter.
brated wave meter in the upper right hand corner. Each machine is a con
easily carried in a scout plane, and operated by means of a wind-driven
change-over from transmitting to receiving is made by means of the triple
of tubes. The same tubes are used for reception and transmission, simplify
which are of such construction that a phone or microphone can easily be inser
tain way. The apparatus can also be used for telephone work, making it a
velously flexible instrument

(C. Kadel and Herbert)

During the Silver Jubilee Celebration of Greater New York held at the Grand Central Palace this ocean liner, an exact model of one of the grey-hounds of the waves, attracted interest because of the radio set that it contained, and which actually worked on the few feet of fine wire strung back and forth on the antenna and masts of the ship.

(C. Kadel and
The radio room
used for inter-
lines of the new
Electric

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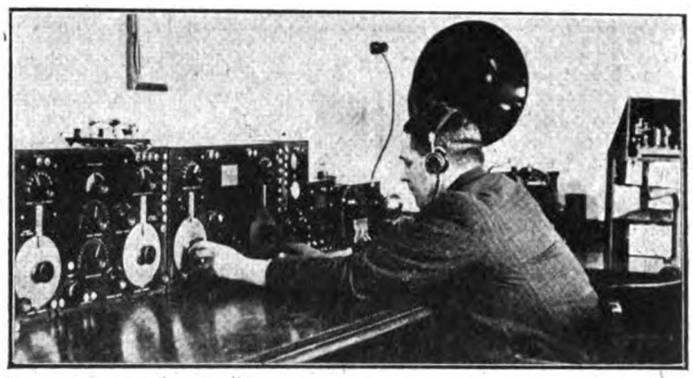
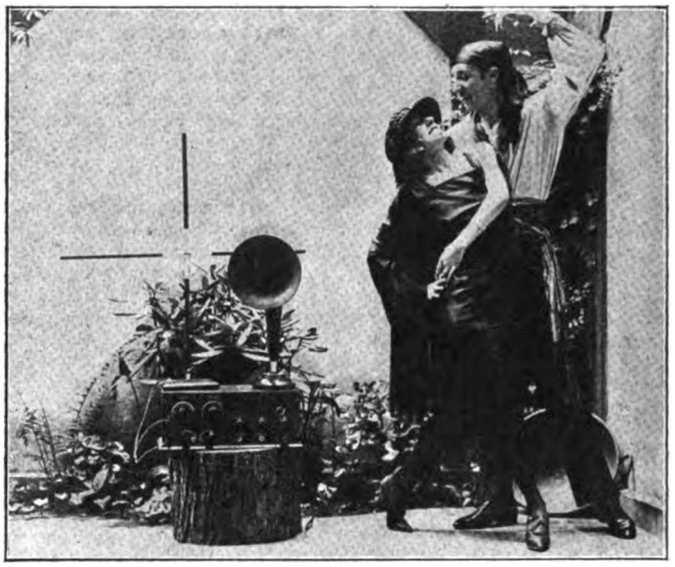
Corps, testing out the famous "Porte E10" French Army porta- receiving messages to planes manoeuvering over the field to ransmitter. Note the apparatus on the left, showing the cali- ine is a complete receiver and transmitter, capable of being wind-driven generator. Each machine has six tubes, and of the triple pole double switch seen directly under the bank sion, simplifying matters considerably. Note also the jacks, only be inserted in the right manner, due to the slots cut a cer- making it a wonderfully compact but at the same time mar- le instrument.

(C. Kadel and Herbert)
The radio room at the supply base of the U. S. Naval Reserve which is used for inter-fleet communication between the eagle boats and the supply base of the naval forces. Chief Radio Officer Harold Cook at the Western Electric 9-36 transmitter. This is a popular type of transmitter on the destroyers and smaller boats because of its ease of operation and its power.



(C. International Newsreel)
The interior of the radio station maintained by the U. S. Shipping Board at Bush House, London. This is one of the most powerful stations in England, as communication clear across the Atlantic is an every day occurence. Constant communication with Annapolis and Panama are assured due to the powerful tranamitters and latest type hetrodyne receivers, but, of course, on the longer wave lengths.



(C. Kadel and Herbert)
Addison and Fowler have taken advantage of the free jazz music over the radio to practice their tangoes. They are shown in one of the difficult steps in their original dance, "Old Madrid," in the Venetian garden of Miss Fowler's Long Island home to the tune of "La Paloma" received on their three-tube loop receiver.

(C. Kadel and Herbert)
Miss Anna Louise Kadel listening in on the lawn to some of the broadcast tales. By the look of the "pup" they must be telling bedtime stories, or else giving a talk upon "how to hold a mashie correctly and acquiring the correct stance," which, of course, is of little interest to the canine mentality, so Mr. Pup follows his instinct instead and snoozes.

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

The late Warren G. Harding was the first President of the United States to talk to the people through a radio microphone, and thus spoke to more persons directly than any other Chief Executive. President Coolidge has already spoken by radio through Station WJZ.

* * *

A radio organization known as the Radio Sociedade do Rio de Janciro has been formed in Rio de Janeiro, and already has more than 100 members. Several influential men of the city are among the officers and directors. It is also announced that a daily broadcasting service will be inaugurated by the Praia Vermelha station.

* * *

Station WGM, Atlanta, Ga., has been donated to Georgia School of Technology, making it one of seventy-eight educational institutions now operating radiophone stations. The power of 500 watts ranks it as one of the most powerful stations in the educational class. The equipment will be used for research work.

* * *

Mrs. Calvin Coolidge, new "First Lady of the Land," is an ardent radio fan, and derives much pleasure from her set, which is a large one of improved type. Mrs. Coolidge for some time has had a set in her room at the New Willard Hotel, used temporarily as a White House following the death of Mr. Harding and the elevation of Calvin Coolidge to the Presidency, and will probably take it with her when President Coolidge takes official possession of the White House.

* * *

A new agreement between the Chinese Government and the Federal Telegraph Company, in conjunction with the Radio Corporation of America, has been signed for the construction of five wireless stations in China. Announcement was made by Richard P. Schwerin, president of the Federal Company, upon his arrival from the Orient at San Francisco last week. The American Legation at Peking later confirmed the news. Two of the five stations will be erected at Shanghai, one of them to be the most powerful in the world. The others will be at Peking, Harbin and Canton. Their aggregate cost will be about $13,500,000.

"Jazz fog" is the descriptive name applied by the neighbors of Col. E. H. R. Green to the programs broadcast every evening from his private radio station at South Dartmouth, Mass.

* * *

On the outskirts of Niagara Falls, N. Y., the city has provided a camping ground for tourists. Over the week-ends the camp numbers several hundred persons, and in the evening after the sightseeing for the day is finished radio equipped automobiles entertain the tired travelers.

* * *

One hundred and fifty children between the ages of 1 and 5 years are playing on the lawns of Tranquillity, the country home of the Israel Orphan Asylum, breathing air free from the heavy heat of the city and romping with a freedom impossible in a city institution. Radio equipment makes it possible for them to listen to bedtime stories and music broadcast from various stations. It is said that Tranquillity is the first institution of its kind to be radio equipped.

* * *

French Ministry of Posts, Telegraphs and Telephones is taking steps to give ships in French ports telephonic connection with land. At present a ship is in touch by wireless with the land until she reaches dock. Then, when only a few yards of water separates her from the shore, she is isolated. This handicap is to be overcome by means of a short submarine cable which will connect the ship with the city telephone system. In a few months passengers arriving at Havre can telephone to friends in Paris before leaving the ship.

* * *

Professor W. De Sitter, a Dutch savant, has propounded the novel theory that the earth is not solid, but built on the order of a trembling ball of jelly. De Sitter bases his theory on observations of wireless. It is frequently observed that there is a difference of several hundredths part of a second in the time of transmission of messages between two fixed points. Hitherto this difference has been ascribed to atmospheric conditions. De Sitter, however, declares the earth is a trembling mass and that the two points moved nearer or further away from each other.

RADIO PRIMER

By Lynn Brooks

INCREASING THE POWER OF YOUR AMPLIFIER—With many circuits an amplifier is necessary in order to get volume in anything outside of local work. The main trouble with such circuits employing two amplifying tubes is that the distortion of voice and music is so bad that it robs the original signal of any vestige of its inherent qualities.

There is one way in which distortion can be removed from amplifying circuits. That is by the employment of a grid "C" battery. As is probably understood, the grid in the amplification circuits should always have a negative potential. The moment a positive charge is allowed to affect the grid, the signals will be distorted.

The proper place for such a battery is in the filament circuit side of the amplifying transformer. For this purpose a single flashlight battery of the No. 751 type will be sufficient. The negative pole should be connected in the grid lead, and the positive in the lead that goes to the filament. A battery such as this will last for six to eight months with ordinary use.

In the second stage of the amplifier, it is best to employ two such batteries connected in series. This will effectively cut out all distortion in the amplifying crcuits and signals will be amplified with all their original characteristics which is something that cannot be said of the majority of home-made amplifiers and even most of the factory-made products. In the case of the factory-made product, this will probably necessitate the breaking of a connection and the soldering in of the battery line, but in any case the advantages of doing it are so many that it overcomes any objections you may have toward rearranging your set.

USE OF CONDENSERS SHUNTING TRANSFORMERS—In many cases builders are mystified because of the fact that some diagrams show condensers across the primary and secondaries of audio-frequency transformers, and other diagrams do not. They therefore do not know whether these capacities can be shunted across all the transformers, whether they are specified or not.

In the case of the high ratio transformers that are sometimes used, the transformer ratio is so high that a condenser across the primary and secondary windings will materially help the amplification. It does not matter whether it is specified or not in the diagram, because simply as a matter of experiment it can be tried, and in ninety-nine cases out of a hundred the results will prove satisfactory.

For the New Army of Radio Beginners

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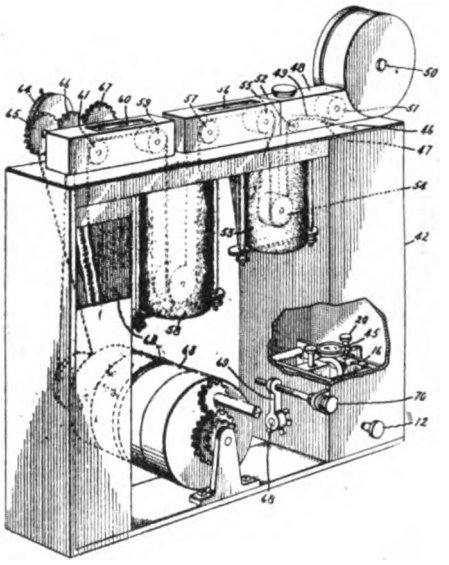
Latest Radio Patents

Recording Apparatus

No. 1,456,595: Patented May 29, 1923. Patentee: Charles A. Hoxie, Schenectady, N. Y.

My present invention relates to an apparatus for and a method of making a record of small electric current impulses and more particularly for recording photographically impulses corresponding to received radio signals.

In receiving radio messages it has been customary heretofore to employ at the receiving station some form of detector which will be acted upon by the high-frequency wave received, in such a way as to produce a current capable of operating an ordinary telephone receiver. The reception of the message has depended upon the ability of the receiving operator to translate the sounds heard by him in the receiver into the characters or letters making up the message. This method has the disadvantage that in case the operator fails to understand any of the



Method of recording slight electrical impulses similar to radio signals, which can be reproduced at will.

letters or words it is necessary to have part of the message repeated in order to make sure that it is correctly received. In case the receiving apparatus is affected by stray impulses or so-called static, which may be of much greater intensity than the signaling impulses, the response in the receiver produced by these stray impulses is so much greater than that produced by the signaling impulses that their effect upon the ear persists even after the stray impulse has passed and the effect of a single stray impulse may be of sufficient duration to prevent the operator from hearing several of the characters of the message. This method of signaling also has the disadvantage that it is physically impossible for an operator to receive messages which are sent at a rate greater than twenty to thirty words per minute.

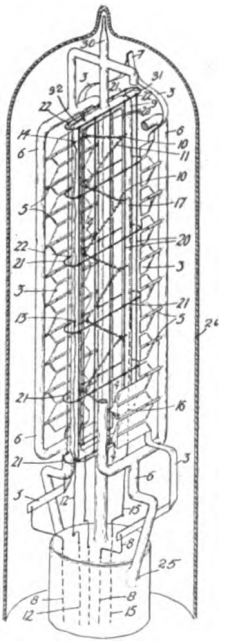
The object of my invention is to provide a receiving system which will overcome the disadvantages above mentioned as well as others. In carrying out my invention I provide means for making an oscillographic record upon a tape, of the signaling current which in the old system acts upon the telephone receiver. The photographic impression upon the tape is automatically developed immediately after it is made and the apparatus so arranged that the message may be read from the photographic record very soon after the record has been made. The apparatus which I provide is also capable of recording messages at a much faster rate than they can be received by ear, the possible speed of the operation being several hundred words per minute instead of twenty to thirty. The effect of stray impulses upon the recording device will last only as long as the impulse itself lasts and will not affect the reception of any of the succeeding characters of the message. Hence a stray impulse, which with audio receiving might obliterate a whole word, may affect only a single letter of the photographic record and not interfere at all with the proper receiving of the message. It will also be apparent that the degree of skill required to read a photographic record of the message will be much less than that required to receive the message by ear.

Arnold's Electric Discharge Device

No. 1,456,528: Patented May 29, 1923. Patentee: Harold D. Arnold, East Orange, N. J.

This invention relates to electric discharge devices and in particular to an improved construction and arrangement of electrodes for the purpose of producing a large current output therefrom.

In designing devices of this type for large current output it is sometimes essential among other things that the tube or vessel enclosing the various electrode elements should be evacuated to as high a degree as possible; a process which involves driving out any gases which may be occluded by the various metallic surfaces within the tube. This can best be done by heating the various electrode elements by some external means during the process of evacuation. Where large electrode surfaces are employed the problem of heating them to a sufficient degress to drive out these occluded gases becomes a matter of some difficulty. This is particularly true in the case of the anode or output electrode, which is customarily in the form of a plate and cannot readily be heated by passing current through it owing to its low resistance and the consequently high currents which would therefore be necessary.



New means of constructing the elements of a three-electrode tube, rendering it easier to exhaust due to the construction allowing heating of anode as well as cathode.

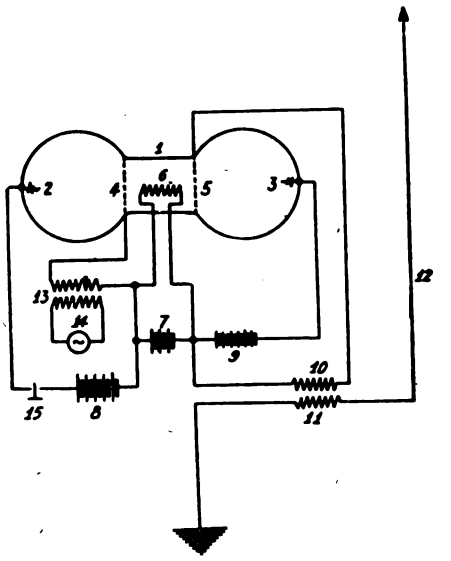
This invention provides an output electrode which is made up of a plurality of bands or strips serially connected and thereby capable of being heated by the passage of an electric current through its length, thus making possible the heating of the anode during the process of evacuation without the employment of unduly high currents.

A further object of this invention is to provide a substantially continuous anode surface composed of a plurality of serially connected sections.

Receiving Arrangement for Wireless Telegraphy

No. 1,454,328: Patented May 8, 1923. Patentee: A. Meissner, Berlin, Germany.

The object of the invention is an improvement on the wireless telegraph



Method of utilizing alternating current to actuate radio transmitter.

receiving arrangement disclosed in German Patent 332,581.

In accordance with the main patent, a cathode relay is actuated by means of an alternating current generator at the receiving station, whereby the received high frequency energy is at the same time transformed and amplified. The changes in the intensity of this alternating current may then be observed by well known means, such as an ordinary telephone. The sound of the local alternating current source may then be heard corresponding to the signal received.

In accordance with the present invention, a particularly advantageous arrangement consists in that the cathode relay is a tube having two anodes and two amplifying grids, whereby one grid is operated by the incoming high frequency, and the other by the alternating current

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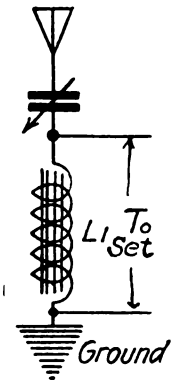
Answers to Readers of Radio World

I have constructed a one tube reflex set and am bothered by the A. C. hum from the lighting circuits. On local stations this hum is not very pronounced, but when tuning for distance it is so noticeable that it drowns out the other stations. This is not due to arc lights as they are not used. The lights go out at 11 P. M. and when they are out everything is fine, but while they are on, the working of the set is almost impossible. Also I get the carrier wave of the station. This is not supposed to be noticeable in reflex sets, but the fact that it oscillates does not seem to hurt reception. What kind of a coupler is best to use with this circuit? Where can I purchase a variocoupler using the honeycomb type winding on both primary and secondary? What type of crystal has been found to work best in reflex circuits? Can you suggest any manner of getting rid of the A. C. hum?—Earl A. Wright, Cole Camp, Mo.

* * *

One method of decreasing the A. C. hum is shown on this page. It consists of about 25 or 30 turns of No. 20 SCC wire wound on an iron core and connected as shown. This will probably cure your troubles. Induction hum in a set of your type is extremely bothersome and just about as hard to get rid of. Another way would be to find out if any light wires run parallel to your antenna and change your antenna so that it runs at right angles to them. The carrier wave you mention is due to your set oscillating. This is common with reflex sets due to feedback through the transformer windings. If it does not seem to hurt your reception it is probably not serious, but suggest that you do not place your transformers in such a position that inter-coupling would be possible. Also do not run your leads parallel. You may use any well made coupler that reaches the desired wave lengths. Apply to your nearest dealer. He can supply you with the information as to where to obtain the coupler you desire. A galena or synthetic crystal is best for reflex reception, using a fine catwhisker and setting the detector proper on a felt or rubber pad.



One method of decreasing the induction hum from nearby light and power lines. It is a choke coil connected across the antenna and ground leads of the set which acts as a frequency choke for the low tension induction.

* * *

Kindly advise me how I can use the enclosed diagram so as to operate a loud speaker. I do not wish to reassemble my set, as it works fine now. What will be necessary?—H. Burroughsford, 54 Parkway Avenue, Toronto, Canada.

A circuit suitable for your use appeared in RADIO WORLD, page 20. If you wish, you can construct this apparatus in a separate cabinet and by using separate batteries for your amplifiers and detector you need not disturb your receiver connections.

* * *

Can I use a 43 plate condenser in a single condenser?—Charles Robertson, 15 Second Street, Lowell, Mass.

Where the diagram calls for an 11 plate condenser, use an 11 plate condenser. If you are just asking for information as to whether a 43 plate condenser can be used in a single circuit—yes, it can.

* * *

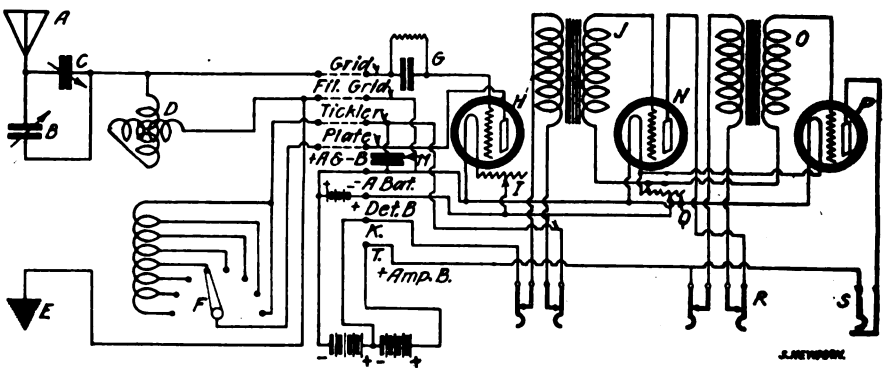
In regard to the crystal set published in RADIO WORLD by Richard B. Wilbur, will you kindly inform me if the beginning and ending of the primary coil are left open or are they brought to taps for the first and last turns?—H. E. Leniback, 1953 Randall Road, Cleveland, Ohio.

The turns you mention are used as the first and last turns of the coil and should be brought to taps.

* * *

Will you kindly furnish me with the circuit diagram used in the Radio Corporation set, the RA with two stages of audio-frequency amplification? — R. D. Campbell, Room 816, 949 Broadway, New York City.

The circuit diagram you wish is published herewith. For your information, the variometer and condenser turn on the same shaft at the same time, both being at maximum or minimum together. The plate coil used for regeneration is preferably wound on the same tube as the stator of the variometer. The regeneration control is governed by the taps on this coil, while the wave length is controlled by the variometer and condenser. A 23 plate vernier condenser is used, with the three plate vernier separate.



Circuit diagram used in the RC and RA-DA combination receivers. A—antenna, B—condenser on same shaft as rotor of variometer, C—3-plate vernier, D—variometer, E—ground, F—tickler wound on same tube as stator of coupler and tapped, G—grid leak and condenser, H—detector tube, I—detector rheostat, J—first audio transformer, K—detector B battery lead, M—condenser across phones, N—first amplifier tube, O—second audio transformer, P—second amplifier tube, Q—amplifier rheostat with tap for grid return of amplifier transformers, R—first stage audio amplifier jack, S—second stage audio amplifier jack, T—amplifier B battery plus tap.

* * *

Kindly give me a suitable circuit for adding two steps of audio-frequency to the Rumford All Wave Universal Receiver described in RADIO WORLD April 7, 1923.—J. A. Beauchamp, Montreal, Canada.

A suitable diagram for this purpose was published in RADIO WORLD August 18, page 20. It is not necessary to reprint the detector circuit as this additional apparatus can be constructed in a separate cabinet connecting it as shown, and just plugged in to the present set, or connected by means of two bridging contacts.

* * *

I have made a four-foot standard for a loop and began at the outer end of each arm and placed 24 small nails one-half inch apart. I began at the inner end of the arm and strung my wire (annunciator bell wire), giving me 24 turns on the loop. Where does the inner end of the loop go? Does it make any difference whether it is strung across the front or back of the wires in order to get it to the receiver? Does the fact that I used wire nails make any difference if the wire is well insulated? Are time?—Charles E. Stevens, M.D., Gogebic Hospital, Bessemer, Mich.

The two ends of the loop go across the variable condenser which is in the first tube circuit. (See RADIO WORLD, July 28, page 13, which will illustrate this.) It makes no difference whether it crosses in front or in back of the loop. The nails should make no difference if the wire is well insulated. Both ends of the loop are used at the same time. When you use a loop it is not necessary to use the coupler, and it should be disconnected from the circuit. The fact that you note a difference in tuning when you use a loop and when you use an outside coupler with antenna and ground is due to the fact that when the change is made, the constants of the circuit proper are changed and therefore the condensers will have to be tuned higher to compensate for the loss of inductance. This does not signify that the circuit is not working properly, so you need not bother looking for trouble where none exists, provided the circuit works properly with both loop and antenna and ground, when each is used separately.

* * *

What causes station WGY to come in strong on my receiver one minute, and then gradually fade away? I have a three-tube set made by the —— Co. and local stations are fine, but on this station and on some of the Philadelphia stations, I cannot seem to keep them tuned in. Is it the fault of my operation, or my set? How should I tune my set to remove this?—James Phelan, Hudson Street, New York.

The "fading" you notice is not the cause of either your tuning or your set. It is very notcieable on the stations you mention. You cannot remove it by tuning your set. The station will "fade" in and out like that continually for some time, and then will settle down to a steady volume for a while only to commence fading again. You cannot stop it.

* * *

In RADIO WORLD, February 10, you describe a set built by E. M. Pace. Kindly give me directions for building a coupler suitable for this receiver.—George K. Menyersen, Chicago, Ill.

For building a coupler suitable for this set, get a 3½" fibre or composition tube, 6" long, and a 3" rotor. On the tube wind 15 turns of No. 22 DCC wire without tapping; then drop the winding down about ½" to allow space for the shafting of the rotor, and wind on 70 turns, tapping each tenth turn, and bringing it out to the switch points as shown. Wind both sides of the rotor full of the same wire

Properly Installed Antenna Greatly Aids Better Reception

ALTHOUGH the receiving sets that are in use among the majority of broadcast listeners to-day will function fairly on even poorly constructed aerials, says a writer in the New York Tribune, it will surely improve matters if the antenna is well designed and the factors which constitute the design are known. The aerial is the source of the energy which directly operates the receiver, and it is obvious that if we can increase the amount of energy collected by the antenna, through judicious design, we can thereby also increase the over-all efficiency of the receiver.

There are more factors entering into the problem of constructing a good aerial than one would imagine from a superficial glance at the subject. These factors include height, length, insulation, grounding, material, proximity to other objects, etc., on the requirements of which a brief resumé will be given.

Height.—It is a well known fact that the higher above the earth's surface one is the greater is the degree of electrification of the atmosphere, varying with local conditions. By way of example an insulated antenna 400 feet high will soon become charged to a potential in the neighborhood of 10,000 volts. This charge has to leak off in some way and will jump small gaps, such as the separation between the plates of the series antenna condenser, in order to get to ground. This produces X's, otherwise known as strays, static and atmospherics. Hence as a rule it is advisable to keep the receiving antenna low, of course, within limits. It has been found that a height of about forty feet is most suitable for good reception. It must be pointed out, however, that strays which come from a distance are not cut down, relative to signals, by using a low aerial. Such discharges are highly damped wave trains and affect the aerial in the manner of an ordinary signal.

Ground.—Since the whole aerial circuit should have a low resistance the ground selected should have as great a surface as possible exposed to the earth. In city districts the best ground is the cold water pipe, it being sometimes desirable to connect both gas and water pipes together for the ground. In country districts several metal plates, about two or three square feet in area, should be imbedded in the ground, surrounded by some charcoal. The plates should be connected to each other by rubber covered wire, soldering the connection. In dry weather the place may be watered, the charcoal retaining the moisture for some time. A type of ground such as this also would be of use as a transmitting ground. The ground wire should be at least of the same size as the lead-in wire and should be short—the shorter the better. The aerial itself should not be more than seventy-five feet in length.

Insulation.—It is of the utmost importance that the insulation of the aerial wires should be nothing but the best if any pretense to efficiency is made. Thoroughly glazed porcelain insulators are the accepted standard for insulation quality, though other materials, such as rubber, bakelite and mica compositions have their adherents. Instead of using one single long insulator it is better to use two or three small ones strung out one after another, as this offers less chance of leakage taking place. The lead-in should be given special attention where it enters the house. Most of the energy losses occur at this point and it does not pay to use the best insulation at the aerial only to lose the carefully hoarded energy by installing a poor lead-in insulator.

Material.—For receiving purposes a single wire is all that need be used. Four wires do not bring in a station better than one. It is a common error to suppose that four wires can pick up four times as much energy as one in receiving. It is true, however, that in transmitting four wires can and do carry a great deal more energy than one. The use of iron wire is not recommended in any form. Instead, use aluminum, copper or phosphor bronze. The lead-in can be made of the same wire, keeping it well away from the side of the building, six feet not being too great a distance by any means. A rather large size of wire should be chosen for the aerial, the thought to increase the surface being the reason for the heavier wire. A small wire is a poor investment for the reason that it corrodes very soon, leaving but a thin core of metal, surrounded by a coating of oxidized matter. This corrosion causes the wire to lose its original strength and, further, the electrical resistance is greatly increased. The latter is the most serious of these two disadvantages. With a heavy wire, or one that is composed of a number of smaller strands, these difficulties are offset for a longer period of time, although they too will not give everlasting service.

Proximity to Other Objects.—If possible the antenna should be stretched over a clear space, free from buildings and trees. It should not be strung in between two tall structures, as then these objects will cut off and screen the passing radio wave. If one end is supported by a tree allow the insulator at that end to extend at least ten feet from the branches. The tie rope or wire only needs to be lengthened to do this. The position of the lead-in has already been touched upon. Keep all wires tightly stretched.

Do not run the aerial parallel to any electric lighting or power line, nor the telephone lines. It is not advisable to get too near any other neighboring antenna either. When in such a position too much interference is apt to result, being caused by the phenomenon of induction.

It will repay you to go over your present aerial installation, keeping the above facts in mind. You will be surprised at the difference that a few changes can make if carried out in all earnestness.

Radio Broadcasting Plant Unharmed by Lightning

IF any further evidence were necessary to prove the safety of radio, there was plenty furnished during a recent severe electrical storm. Lightning entered Station WGI, Medford Hillside, Mass., during the worst of the storm. Investigation showed that it was attracted by the electric light wires, which it completely demolished. The electric light service was paralyzed. However, the 320 ft. steel antenna tower was not touched, nor the powerful broadcasting apparatus, proving that a radio antenna and a receiving or transmitting set does not attract lightning.

Time was when uninformed persons thought the installation of radio provided an extra fire hazard. This belief has been somewhat dispelled by the experts who call the lightning hazard of radio a "childish bugaboo."

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R2 Magnavox Radio *The* Reproducer Supreme

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Where the reproduction of broadcasted programs is desired in large volume, the Magnavox Reproducer R2 should be used.

Thanks to the Magnavox (electro-dynamic) principle of construction, this result is secured with minimum electrical energy.

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Magnavox R3 Reproducer and 2 stage Power Amplifier . . . $90.00

R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field $60.00

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . $35.00

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AC-3-C, 3-stage, $75.00

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The Magnavox Co.
Oakland, California
New York Office: 370 Seventh Avenue

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Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. *Telephone Bryant 4796*

Appreciates Our Exposure of Fakes

RADIO WORLD,
Editor:

I am not given to writing to the editors of newspapers and magazines, but your paper has done one thing which is very commendable, and that is the publication of articles relative to spurious radio corporations, etc. Some months ago you published articles regarding the defunct International Radio Corporation, and now your paper carries an article dealing with imitation Brandes 'phones. Fine! It would be better if more magazines did this. It is a public service and one which should be appreciated by the public at large, and the publication that follows this policy should have the support of the public to the fullest extent. You have mine.

*Whatever became of the International Radio Corporation? Might it not be of interest to your readers to state how well this corporation "died"? Several Baltimore "investors" would be interested.

Very truly yours,
M. J. HITCHCOCK.

Baltimore, Md.

*EDITOR'S NOTE: Write to National Radio Chamber of Commerce, 165 Broadway, New York City.

New Radio and Electric Firms

Radio Mfrs. Outlet, New York City, radio materials, $10,000; A. Wellington, J. Morganstein, S. Kassever. (Attorney, D. G. McConnell, 45 Cedar street, New York City).

Service Appliance Co., Schenectady, N. Y., electrical contractors, $50,000; H. G. Vedder, J. M. Brucker, Jr., E. E. Grigaleit, Jr. (Attorneys, Blodgett & Smith, Schenectady.)

Sorenson Scientific Corp., New York City, make laboratory apparatus, 250 shares preferred stock, $100 each; 100 common, no par value; active capital, $10,000; C. M. Sorenson, F. A. Boersch, T. S. Wood. (Attorney, the company, 177 East 87th St.)

Nylco Electric, Jamestown, N. Y., $25,000; F. A. and F. R. and A. C. Nelson. (Attorney, R. M. Bates, Jamestown).

Radio Sales Corp., $50,000; J. R. Davis, T. Davis, R. Fitzpatrick, Wilmington, Del. (Lawyers' Corporation Co.)

First Radio Mystery Serial from WJZ

SERIAL stories are a well-known feature of magazines, but as items of radio programs they are practically unknown as yet. Doubleday Page and Company believe that the idea is practical—WJZ thinks it is—and from now on the radio audience will have a chance to decide the question every Thursday evening as long as "The Waddington Cipher," a Doubleday Page publication, runs. Just what the listeners will think of the radio serial is an interesting question—it is a new departure in programs, and the reception of new departures is always a matter of interest.

Radio Trade Notes

The Radio Electric Shop, 421 East 31st St., Kansas City, Mo., has entered the retail radio business.

* * *

W. P. Harper, 360 Juan Manuel St., Guadalejara, Mexico, is reported to be in the market for broadcasting stations, transmitters and transmitting sets.

* * *

P. L. Spencer, 4129 North Eighth Ave., Birmingham, Ala., has opened a retail radio store.

* * *

Radio Limited, 497 Phillips Square, Montreal, P. Q., Canada, is in the market for an extensive list of radio goods.

* * *

Clement E. Anderson, Unionville, Mo., has started a retail radio business.

* * *

Fred Wittig, Cohocton, N. Y., wants to buy choke coils.

* * *

National Radio Engineering Co., Atlanta, Ga., is in the market for an extensive list of radio apparatus and mailing lists.

* * *

Gilbert H. Ludlow, 306 Market St., East Liverpool, Ohio, wants prices on receiving sets and vulcanized fibre sheets.

* * *

The Van Blaricom Co., Helena, Montana, are in the market for cartons for shipping goods.

Daily Newspapers Publishing Radio News and Programs

AS a part of its service to readers RADIO WORLD publishes herewith the names of daily newspapers which carry radio programs and radio news. Wherever possible the name of the radio editor of the paper is given. Additions to the list will be published as received.

Morning Oregonian, Portland, Oregon. Publishes daily radio programs of its own Class B station, KGW, and other Pacific Coast stations, and on Sunday a complete page of technical news and features. Radio editor, Saul Emanuel.

A Warning to WHN!

RADIO WORLD has received complaints from a number of fans regarding the "rough stuff" broadcast from Station WHN, Loew's State Theatre, New York City. Mixed with a hodge podge of vaudeville and variety songs and music are remarks from the announcer and some performers that closely approach the offensively vulgar.

WHN is reminded that almost every sound in the studio is transmitted and the audience reached always includes refined people of both sexes. Here is a case where responsibility and obligation should go hand in hand with privilege.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

R. M. Seward, 107 Logan St., Altoona, Pa.

Frank La Valle, 2529 Cambrelleng Ave., New York City. (Wants to establish retail radio business on small scale.)

J. P. Fitters, 224 Adam St., Steubenville, Ohio.

Clarence Gibbons, 342 Exchange St., New Haven, Conn.

J. E. Greene, 64 Sheffield Ave., New Haven, Conn.

C. B. Gowan and R. L. Lockett, 515 Galveston Ave., Fort Worth, Texas. (Retailers. In market for parts.)

Michael E. Kondrat, 94 Exchange St., New Haven, Conn.

Einar Aarnodt, Room 310, Hort Bldg., University Farm, St. Paul, Minn.

C. F. Colton, 26 Ningkno Road, Shanghai, China.

Robt. B. Clark, 1247 Texas Ave., Sawtelle, California.

A. C. Pforzheimer, Broadway, Woodmere, N. Y. (Wants agencies for reliable manufacturers.)

Paul Nilsen, Box 1010, South State St., Jackson, Miss.

Joseph M. Edwards, P. O. Box 207, Tukegee, Alabama.

Roy Ruskin, 314 Morgan St., Boonville, Mo. (Retailer. Wants wholesale prices.)

Merle Abrams, Box 894, Burkburnett, Texas.

Harry A. Muir, 532 Cherokee St., Denver, Colorado.

L. W. Macomber, 377 Somerset Ave., Taunton, Mass.

George C. Blackwood, 243 East Upsal St., Mt. Airy, Philadelphia, Pa. (Wants hinged lid cabinets, 12x14 or 12x18, or sizes between these.)

Chas. Whiting, 7120 Fifteenth Ave., Brooklyn, N. Y.

The Radio Sales & Service Co., 609 Freeman St., Lyndhurst, N. J.

Wesley Blalock, P. O. Box 315, Montgomery, Ala.

Alfred T. Maund, Jennings, La. (Dealer.)

L. J. Hamilton, 909½ Steiner St., San Francisco, Cal.

G. D. Wilcoxon, 1414 Seventh St., Santa Monica, California.

C. W. Ferguson, 15 Wyoming St., Roxbury, Mass. (In market for a three or four tube set.)

Byron Miller, Star, Oregon. (In market for parts of a good commercial set and a 50 watt transmitting outfit.)

Lake County Overland Co., Leesburg, Florida. (Installing radio department.)

Jack A. Segel, 800 Dorian Court, Far Rockaway, N. Y. (Wants to purchase receiving set.)

Richard Burch, 30 Fifth Ave., New Rochelle, N. Y. (Wants receiving set and loud speaker.)

E. C. Giggy, Orosi, California.

L. L. Price, 514 Chestnut Ave., Du Bois, Pa.

C. G. Richardson, 2012 Avenue G, Brooklyn, N. Y. (Interested in fixed mineral detectors for reflex circuits.)

Louis Nathan, 72 Rodney St., Brooklyn, N. Y.

J. A. Shields, 688 Howard Ave., Bridgeport, Conn.

J. G. Kaufman, 117 Avenue C, New York City.

New Brandes Factory

C. BRANDES, Inc., 237 Lafayette St., New York City, manufacturers of the popular "Matched Tone" headsets, have purchased a new factory at Newark, N. J., containing over 46,000 square feet of floor space. With its other factories the company will now utilize over 70,000 feet of floor space all devoted to the manufacture of headsets.

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Broadcasters Urge Change in Copyright Law

IN a friendly suit brought by M. Witmark & Sons, well-known music publishers of New York City, against L. Bamberger & Company, department store proprietors and owners and operators of broadcasting station WOR, Newark, N. J., in the United States District Court for the District of New Jersey, to determine whether the broadcasting of copyrighted music by radio violated the copyright law, Judge Lynch decided that it did, and ordered:

"A decree will be entered in favor of the plaintiff, but restrain will be withheld pending a review of this opinion."

Judge Lynch concluded a lengthy opinion as follows:

"There is another point which, although striking us as immaterial, deserves some comment. The defendant argues that the plaintiff should not complain of the broadcasting of its song because of the great advertising service thereby accorded the copyrighted number. Our own opinion of the possibilities of advertising of radio leads us to the belief that the broadcasting of a newly copyrighted musical composition would greatly enhance the sales of the printed sheet. But the copyright owners and the music publishers themselves are perhaps the best judges of the method of popularizing musical selections. There may be various methods of bringing them to the attention of music lovers. It may be that one type of song is treated differently than a song of another type. But, be that as it may, the method, we think, is the privilege of the owner—he has the exclusive right to publish and vend, as well as to perform.

"Considering all of the facts and circumstances, it is the conclusion of the Court that the broadcasting of the defendant was publicly for profit within the meaning of the Copyright Act as that meaning has been construed by the United States Supreme Court."

The National Association of Broadcasters, 1265 Broadway, New York City, through Paul B. Klugh, executive chairman, has issued a statement in connection with the decision, as follows:

"This decision justifies the position taken by this association from its inception:

"1. That our efforts be directed toward a revision of the Copyright Act, rather than any contest in the courts under the present ambiguous law.

"2. That, because of the proven value of broadcasting in creating sales of sheet music, phonograph records, and piano player rolls (now admitted by Judge Lynch in his decision) it is unreasonable for any musical copyright owner to demand payment for use.

"3. That the American Society of Composers, Authors and Publishers controls but a small percentage of the copyrights recorded in Washington and therefore are in no position to make any concerted demand.

"4. That our Bureau of Music Release furnishes weekly (for use by members only) good, new, copyrighted, popular music without the payment of any fee or tax.

"With our rapidly growing membership and the strength which comes from numbers, the future of the broadcasting art becomes clearer."

RADIO WORLD, in its issue of April 21, 1923, pointed out a way by which the broadcasters could beat the music publishers. This advice seems worth repeating at this time. In brief, it was as follows:

"Let us assume for a moment that we are running a broadcasting station. We receive nothing directly from this service. We do not want to be penalized for broadcasting songs and instrumental pieces which not so long ago the music publishers were dying to have everybody use, and in some cases paid handsome weekly or lump sums to vaudeville singers and other musicians for using. As broadcasters we know we are offering a great public service to radio and the public at large, and feel that the fees demanded should not be paid.

"Supposing, however, that a fair argument does not bring the publishers to terms, what then can be done? The answer is simple. Every music publisher is obliged to boost his numbers so that singers will put them in their repertoire, phonograph companies will record them, and eventually the public will buy them.

"Broadcasters can adopt practically the same method. Good song writers—and some of the most popular and successful in the business—can be engaged on a salary or royalty basis and if their output is released through all the other broadcasting stations there would soon be such a demand for these numbers that the music dealers throughout the country would be placing their orders for hundreds of thousands, and, in some cases, millions of copies. These new numbers could also be released through singers, orchestras, etc., and practically the same method of boosting procedure adopted as is now used by the biggest music publishers.

"Broadcasters should not worry at all when it comes to a matter of getting up-to-date material. They can make their own. They can popularize it in a more expeditious and thorough way than was ever known in the old days of 'song-plugging.' All they have to do is to adopt the methods of their friendly enemy and go right into the song and instrumental sheet music business themselves in the manner indicated."

False Rumor Mongers Being Sought

AN investigation to determine which of the nineteen commercial broadcasting stations, or 2,600 amateur stations, within the second radio district, started the false report previous to the actual event, that President Harding was dead, and that Mrs. Harding had died from the shock has been started by Arthur Batcheller, United States Supervisor of Radio, who has offices in the Custom House, New York City. If the originator of this fraud is discovered his prosecution will be asked, under a Federal radio communication law.

Bolton Hall Tells How to Bring Good Times

WHAT a joke it is to prove that if no one bought anything but hash and corduroy, we would all be rich—at least if we handed our money over to the bank, writes Bolton Hall in Forbes Magazine. But what the bank would do with the money if no one spent anything does not appear.

Simply cutting down our expenditures is simple enough—almost idiotic. It is simply cutting down business, making a "buyer's strike," which is the most stupid of all strikes. To avoid hard times we must keep our expenditures up, increase them if possible; but see that they are made not wastefully but productively.

Don't try to "save" paint on your house or wear shoes with the heels worn down. These are wastes that make want.

We laugh at the old lady who took the remainder of the emetic after she was well "to save it," but we sometimes eat food when we are not hungry "to save it." Better give it to the poor and save your ice, or to the chickens and save your digestion.

True Thrift is the philosophy of saving by spending, particularly by buying productive things, including securities. "Life is not made for savings; savings are made that life may be more abundant here and now."

Can't Sell American Radio Goods in England

THE restrictions against the use of any radio equipment except that licensed by the British Broadcasting Company are making it impossible for English merchants to sell American radio products, according to a report just submitted to Washington by United States Consul Ross E Holaday, from Manchester, England.

Consul Holaday, making an investigation of the radio situation, found that the restrictions upon the use of equipment and the regulations governing the use of wireless sets give the British Postmaster General, through his arrangement with the British Broadcasting Company, an ironclad control over radio. There is no prohibition against the importation of foreign radio products, or against their sale after importation, but this freedom is nullified by the difficulty of securing a license to use any equipment other than that endorsed by the "B. B. C." which collects a royalty on every set manufactured in England.

There is now under consideration by the British authorities the issuance of a new form of license to be known as the "constructor's license," under which people with no technical knowledge will be permitted to assemble wireless sets and use them to receive broadcast and other matter. Even those who purchase the sets manufactured under B. B. C. restrictions are required to secure a license before they can make use of their outfits. This is known as a "broadcasting license" and costs approximately $2.50. Only those persons having "experimental licenses" are permitted to assemble their own apparatus, and to secure such a license the applicant must have a knowledge of the technical side of radio which the majority of would-be listeners do not possess.

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Marvel Capacity Switch

Three-Ways Series, Parallel, Direct-ground

Patents pending

DIAL MOUNTED

Efficient reception is the ability to switch from the short wave lengths to the long, or from the long to the short.

The Marvel three-way switch receives short waves in the series position; long waves in the parallel position, and waves of medium length in the direct-ground by eliminating the condenser entirely.

Strictly of anti-capacity type.

Price....$1.25

Attractive discounts for dealers and jobbers.

MARVEL SWITCH CO.

28 West 25th St. New York City

The Wireless Oracle Speaks

By Billy Bronx

WGR seems to get through regularly these days in spite of all the static. Their programs sure are the berries.

Had some 95% vocal talent from WIAD, the Ocean City Golf Club, of Ocean City, N. J.

Say, WEAF, where do you get all those good orchestras? This time it's the Bruno Brothers' Orchestra. They sure are some jazz babies. What do you say?

We sure did miss you last Sunday evening, Roxy. Let's hope that this unforeseen occasion will not arise again.

William Bruno, you may be another Lopez at the piano, but you're far from another Gilbert or a Charley Tobias with your voice.

Too bad you're not on the air more often, WJAX. Your popular programs sure do make a hit with me.

Have you noticed how busy Lillian May Challenger, the soprano, is these days? She is another one of our prominent artists who always seems to be thinking of the listener-in. Isn't that your impression also?

WMAF is another station that gets through regularly these days. Your programs are a delight, but your modulation is still too full.

By the way, WMAF, is your slogan "The Land of the Pilgrim Fathers" or "Away Down East"? At present you've got me guessin'.

The Melody Belles are some Toodlety-Oot-Tum-Tums and plenty of it. If you didn't hear them you sure did miss something.

You may think that Loew's, Keith's, Fox's or Proctor's offer you the best in vaudeville, but if you tuned in WHAZ last Monday night you would have heard something that has them all beat. To those who listened in: Do you agree with me?

More competition for you, Roxy. First it was the Strand Theatre and now it's Marcus Loew and his crowd. You'd better keep a steppin' lively!

We fight fans sure did enjoy your short talk, Jimmy De Forest. Some of you other limelights of the fighting game ought to make it your business to keep it a-goin'.

Phil Ohman and his Trio sure did make a hit with us. Too bad they were not booked for the evening hours.

Now that we've heard "Adrienne" over the air, we're going to see it. Are you with us?

No doubt you have heard or have seen pictures of amateur stations that are claimed to be as good as broadcasting stations, if not better. Well, to be convinced that this may be true, I would suggest you listen some evening to 2RB who uses phone a great deal and is on a wave length of about 190 meters.

Have you noticed the way the stations in the East, or New England States especially, come through these days? Seems as if the weather agrees with them.

You may have heard two stations broadcasting the same program at the same time, but did you ever hear three stations broadcasting the same program at the same time? If you want to try this, then tune in WEAF on 492 meters, WCAP on 469 and WMAF on 360.

Do You Want LONG DISTANCE on Your Set?

The following stations have been heard with a COAST COUPLER

WDAP—Chicago
CFCN—Calgary
WWJ—Detroit
PWS—Havana
WSB—Atlanta

And Many More

The COAST COUPLER is a necessary part of your radio hook up. Manufactured of the best materials obtainable and thoroughly tested before leaving the factory, it has immediately won recognition in the radio market.

ANYWHERE IN THE UNITED STATES—$5.00

Write for catalogue.

COAST COUPLER COMPANY

245 EAST SEVENTH STREET LONG BEACH, CALIFORNIA

COMO DUPLEX TRANSFORMERS

The COMO DUPLEX SYSTEM of audio-frequency amplification gives the maximum volume without distortion and tube noise.

Type "I" Type "O"

There is a combined filtering action which assures perfect results when ordinary amplification fails.

It can be added to your present amplifier, giving you power amplification on the weak signals that more of the ordinary amplification would kill.

Sold only in matched Pairs, $12.50

A copy of C. White's "HOW TO MAKE A POWER AMPLIFIER" is yours for the asking.

COMO APPARATUS COMPANY

168 DARTMOUTH STREET BOSTON, MASS.

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Please send me RADIO WORLD for ..... months, for which please find enclosed $.....

SUBSCRIPTION RATES:

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Three Months	1.50
Six Months	3.00
One Year, 52 Issues	6.00

Add $1.00 a Year to Foreign Postage; 50c for Canadian Postage.

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No Age Limit in Radio Broadcasting

THE all-embracing auditorium of the air knows no limitations as to age. The great radio audience asks only that the artists entertaining it shall be capable, pleasing and entertaining. Radiophone Station WHAZ, at the Rensselaer Polytechnic Institute, Troy, N. Y., having presented in its weekly concert program of July 30 the oldest singer ever heard through the broadcasting medium, Calvin Dater, of Troy, an eighty-five-year-old baritone, who was greeted with a "storm of applause" in the form of messages of appreciation, swung to the other age extreme the next Monday evening, and offered in its concert program solo numbers by Beatrice Gilbert, a nine-year-old pianist of unusual skill for her age, and duet numbers with her brother, Eugene Gilbert, a thirteen-year-old violinist.

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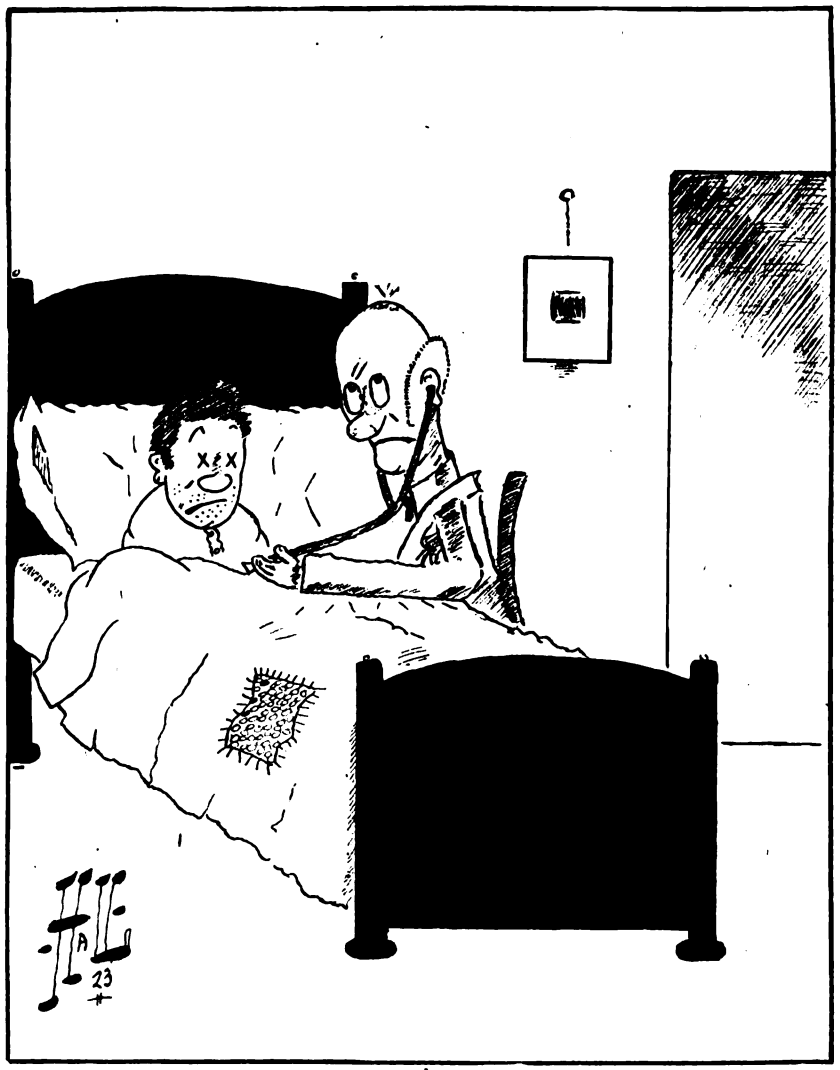


"Listening In"

How Do Crystal Sets Get Distance?

EDITOR RADIO WORLD: Much has been said and written in technical books pro and con regarding the fact that re-radiation of receivers and the oscillations from nearby transmitters are the cause of distance reception on crystal sets.

I am the owner of a receiver of the crystal type, using a tuner, crystal detector, variable condenser and phones, and have done some fine work up to 100 miles.

The other evening while listening in, I tuned down to 200 meters to enjoy a little of the spark work of some of my neighboring amateurs, but soon growing tired, tuned back to phone wave lengths. My neighbor on the next block has an amateur 20-watt phone transmitter and he started in to talk to a friend of his. While he was on (about two minutes), I distinctly heard station WGY, Schenectady, and the moment he signed off, WGY faded right out and things went along on the usual plane.

Located as I am hundreds of miles from that station, I think that this proves that most of the long distance work of some of these crystal fans is due to enforced oscillation from nearby CW and phone transmitters and multi-tube sets rather than to superfine crystals.

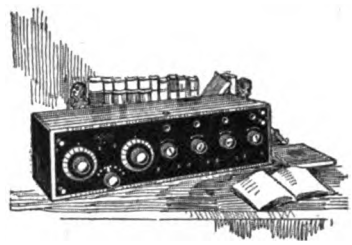
If it doesn't prove it in anybody's mind, I would like to have them explain the phenomenon to me in a manner that will convince me. I am open to argument.

Yours for an early argument on the matter,

PHILIP KEANSBY

Wilmington, North Carolina.

Note: This should hit somebody's pet theories on re-radiation and crystal sets hard.—Editor.



TUNE IN THE WORLD WITH A CROSLEY MODEL X

No matter where you live, the news and pleasures of the world are an open book to you if you own a Crosley Model X.

A man from Belleville, Kansas, writes: "I have found the Crosley Model X to be the best radio receiving set I have used, and permit me to say that I have been interested and using radio sets since the spring of 1922, including all standard makes."

In spite of new features such as the R. F. T. A. Coil and the Multistat, the Crosley Model is still priced at $55.00.

Write for Descriptive Pamphlet.

For Sale by Best Dealers Everywhere.

CROSLEY MFG. CO.

8464 Alfred Street Cincinnati, O.

HEAR 2000 MILES ON ONE TUBE!

Easily made by anyone. No trick circuit. Few parts. Distance, Volume, Selectivity.

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BRAND NEW (Type R-3) Magnavox Loud Speakers

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TYPE "A1"
21" FIBER HORN
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TYPE "B"
(For Phonographs)
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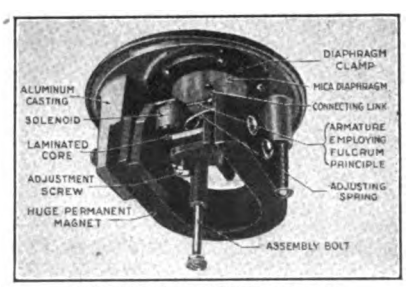

INTERIOR CONSTRUCTION

An ear phone is an ear phone no matter how fancy the horn that covers it may be, and, due to the delicate construction of an ear phone it is utterly incapable of giving true tone reproduction, especially, when relatively large currents are passed thru its coils, such as the output of a two-stage or power amplifier.

The Trinity Loud Speaker element embodies the well-proven and tested principles of the phonograph reproducer with the soundest principles of electromagnetic design best adapted for loud speaker operation. It is not an ear phone when placed on a head band and a loud speaker when covered with a horn. It is a sturdy loud-speaking element ALWAYS.

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U.V. 200—C. 300 ..... $2.00
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WD11-12, VT-1, VT-2, VT-216A Not Accepted

24 Hour Service, and on the Above Types ONLY.

Terms—Cash with order. We will ship C. O. D. if 1/3 price is remitted with order.

All tubes are guaranteed to operate like new and to arrive in good working order.

DEAL DIRECT ! !

SPECIAL—Ship us 5 of the above named tubes and we will ship by return mail one repaired tube FREE of all cost. What do you say? Swap?

Send all tubes parcel post prepaid to

Radio Tube Repair Co.
192 Main St., Milford, Mass.

Program for the Amateur Convention at Chicago

EVENTS of absorbing interest to all radio men are to be crowded into five days of concentrated activity, including technical talks fertile with most recent developments in the radio world, when the largest gathering of amateurs in history convenes in Chicago September 12-15 for the Second National American Radio Relay League Convention, under the auspices of the Chicago Radio Traffic Association, according to the elaborate program just prepared.

Never has there been such a widespread turnout of amateurs as that expected to roll into Chicago from all sections of the United States and Canada, opening the fall radio season with a spectacle excelling all previous conventions and "hamfests." Officers of the A. R. R. L. and other speakers of national prominence call for a full attendance at technical meetings for DX men during a discussion of international amateur tests and achievements.

One of the most timely subjects to all amateurs who have participated in recent transoceanics is the proposed two-way communication tests over the Atlantic and the Pacific. Every conceivable kind of oceanic amateur traffic, from transmissions of signals to complete messages, has been successful, but never have two amateurs established direct contact.

This question and tentative plans for the two-way tests will be taken up at a meeting Thusday afternoon of the A. R. R. L. Traffic Department under chairmanship of F. H. Schnell. Other semi-technical meetings will be held during the convention.

An elaborate banquet at the Edgewater Beach Hotel will precede, rather than wind-up the events as the custom has been in the past, the object being to provide at the outset an opportunity for delegates from all sections to become acquainted.

Some of the time will be given over to field events and various games and contests will be staged between groups of amateurs representing the various A. R. R. L. operating department divisions.

One of the stunts designed to furnish a great deal of amusement will be the search for a hidden transmitting station by means of portable loop receiving sets. This scheme will carry visitors here and there throughout the city on foot, or in automobiles, looking for the mysterious operator, whose position will be carefully chosen.

A special effort is being made by R. H. G. Mathews, central division manager of the League, and other committee men to provide a program which will be of interest to the broadcast listener as well as the amateur and talks covering all phases of broadcast transmission and reception are scheduled for the convention.

A "Night of mystery" is the term selected for the last evening when visitors will be invited to witness the initiation of candidates into the "Royal Order of the Wouff-Hongs." A wierdly elaborate ritual has been prepared and the initiation itself is to be in charge of a group of amateurs from Flint, Mich., at which city the amateur secret order originated.

The weapon known as the "wouff-hong" is an instrument of torture designed by the "Old Man," for years an anonymous contributor to the League's official organ, "QST."

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

AMERICAN RADIO RELAY LEAGUE, second national convention, Chicago, Ill., September 12-15, 1923. Chicago Radio Traffic Association, 959 The Rookery, Chicago, Ill.

Seek Relaxation of German Restrictions

EFFORTS to secure a relaxation of government restrictions under which private radio installations are prohibited in Germany are being made by a radio club established in Berlin early this year, according to a report from Consul E. Verne Richardson to the Department of Commerce.

It is commented that Germany lags far behind many other countries in private radio enterprise, a great contrast to pre-war times, when Germany was well in front in radio matters.

At a recent meeting of the Berlin club there was demonstrated a loop antenna by means of which London could easily be heard.

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Yours Sincerely **Greenwich Radio Co**

185 GREENWICH STREET NEW YORK, N. Y.

Pathe

Moulded Variometers and Couplers... $2.25
Guaranteed 600 M.
Pathe Loud Speaker . $17.50

Crown Transformers.
Adapted for
ALL TUBES, $2.95
Ratio 5 to 1

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U. S. L. VERNIER BAKELITE ENDS CONDENSERS
17 PLATE $2.95
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Do you want to sell your old set?
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If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

Try Radio World's Classified Department for your personal radio and other needs.

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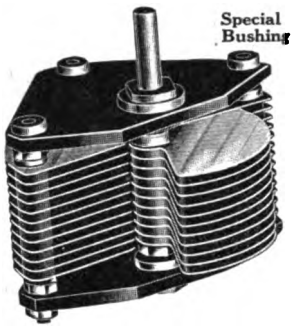

Aetaco Condensers

Are made with just the one purpose in mind of giving you the most serviceable condensers obtainable. Fine adjustment. Accurate spacing.

43 Plate Condenser	$1.75
23 Plate Condenser	$1.35
17 Plate Condenser	$1.25
11 Plate Condenser	$1.00
3 Plate Condenser	60c.

AETACO

Back Mounting Inductance Switch...75c.

Complete line of Receiving and Transmitting Apparatus.

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DX STATIONS ON A ONE TUBE SET

Easily Constructed by Anyone

Guaranteed to Operate or Money Refunded

COMPLETE PARTS

1 Genuine Mahogany Cabinet; 1 Drilled Hard Rubber Grade A Panel; 1 23-Plate Condenser; 1 Variometer; 1 Rheostat; 1 Tube Socket; 2 3-Inch Dials; 8 Initialed Binding Posts; 3 Lengths of Spaghetti; 3 Lengths of Bus Wire; 1 Grid Leak and Condenser; 1 Bezel; 1 Diagram Free.

Only $8.50

Ask for free price list on all standard Radio merchandise. Orders promptly attended to.

GLOBE RADIO SHOP

115-117 West 23rd St. New York, N. Y.

DO YOU WANT PLANS FOR MAKING THE SLEEPER DUOTOL RECEIVER, USING THE SLEEPER TWINS. —Two Variometers and the fixed Coupler? SEND 10c for the June issue of RADIO AND MODEL ENGINEERING.

SLEEPER RADIO CORPORATION

88 W. Park Place New York City

Back numbers of Radio World supplied at regular price of 15c. a copy. Any 7 copies for $1.00. Radio World, 1493 Broadway, New York.

A B C of Aviation

By CAPT. V. W. PAGE. This book describes the basic principles of aviation, tells how a balloon or dirigible is made and why it floats in the air. Describes how an airplane flies. It shows in detail the different parts of an airplane, what they are and what they do. Describes all types of airplanes and how they differ in construction; as well as detailing the advantages and disadvantages of different types of aircraft. It includes a complete dictionary of aviation terms and clear drawings of leading airplanes. The reader will find simple instructions for unpacking, setting up and rigging airplanes. A full description of airplane control principles is given and methods of flying are discussed at length.

This book answers every question one can ask about modern aircraft, their construction and operation. 275 pages, 130 specially made illustrations with 7 plates. Price, $2.50

THE COLUMBIA PRINT

1493 Broadway, New York City

A Good Tip for DX Nite Owls

EDITOR, RADIO WORLD:—I have in the course of my reading RADIO WORLD since it started always had a sneaky idea that I would like to write a letter to the editor, but have never had a chance to get anything to talk about, as everything always seemed to be answered before I could ask it. However, I have at last found an outlet for my wish.

I note that you have had article after article, small and large, concerning the importance of grid leaks being variable, yet never have I seen an article concerning the grid condenser being variable. Personally I have found out that it is equally as important for the grid condenser to be variable as for the rheostat to be variable. I have tried out numerous single circuit sets by White, Gordon, Thompson, Dougherty, and others of your writers. I am not the kind of an amateur that is satisfied with a set, but get most of my fun out of life by making and trying them all. I scarcely keep a circuit more than a week, if that long. I sometimes construct three and four at a time by means of a board with clips, and compare the working of them on a single DX station under the same conditions.

Instead of using the conventional fixed condenser, I use a small three plate variable, connected in parallel with three fixed condensers, so that I can obtain any value from .00001 (pretty small, but I have it) up to .005, and find that a variable condenser of this sort is just as necessary to tuning in DX with volume as any grid leak ever made. I use two .002 fixed condensers in parallel with a .001 fixed and a three plate variable.

I have noticed when using the new UV199 tubes in connection with radio-frequency that this arrangement improves my detector over 100 per cent, and therefore I am giving the idea to the fans through my favorite periodical, RADIO WORLD, hoping that it may help some of the other readers solve some of their DX problems this fall and winter, when they try out some of the new circuits that you publish.

Yours for a DXing year,

JOSEPH BENDA.

Palo Alto, California.

Information from WKAQ About Porto Rico

PORTO RICO—What and Where It Is" is the title of an interesting booklet sent out by the Radio Corporation of Porto Rico, San Juan, Porto Rico. This statement is made:

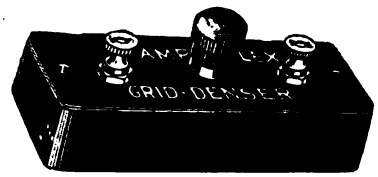
"In the radio logs of thousands of listeners in the Western Hemisphere, two broadcasters occupy honored positions. These stations are WKAQ of the Radio Corporation of Porto Rico, and PWX of the Cuban Telephone Company, Havana, Cuba, both affiliated with the International Telephone and Telegraph Corporation of New York.

"That they are of invaluable service in building a better knowledge of these two lovely islands is proven by thousands of letters received, and which come from Alaska, Canada, the United States, Mexico, and our sister Republics of Central and South America.

"WKAQ hopes that you will enjoy this pamphlet and will tell you more about Porto Rico by radio."

AMPLEX GRID-DENSER

A Variable Condenser (.0005) for the Grid Circuit.



"Delighted with results." — **Scientific American.**

"Use in our Laboratory."—**Prof. L. A. Hazeltine.**

"Works like a charm."—**Dallas Times Herald.**

"Have an excellent set, but failed to get long distance. Placed 'Grid-Denser' in and have picked up 1,000 miles."—**Chas. F. Smisor, Editor, Radio Digest.**

Approved and recommended by Radio Laboratories of Radio News, Radio World, New York Mail and other experts.

DOUBLES the efficiency of your set.

Greater distance
Sharper tuning.
Louder and clearer signals.

PRICE $1.25

At your dealers—otherwise send price and Grid-Denser will be sent immediately.

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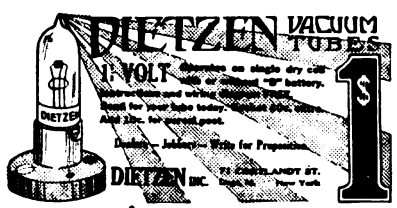

Cram's Radio Broadcasting Map

of the

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Scale 100 miles to the inch
In two colors—Size 34x28"

PRINTED ON HIGH-GRADE MAP PAPER
UP-TO-THE-MINUTE INFORMATION
INDICATING ALL AMATEUR AND STANDARD BROADCASTING STATIONS
WITH COMPLETE INDEX OF STATIONS
35c (POSTPAID)

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1493 BROADWAY, NEW YORK CITY

WANT TO REPRESENT RADIO WORLD?

If you can get subscriptions for Radio World let us know and we will send you a generous proposition. Radio World, 1493 Broadway, New York City.

COMPLETE YOUR SUMMER FILES!

If you were away this summer and missed any copies of RADIO WORLD, we can send you the summer back numbers at 15c a copy; any seven numbers for $1.00. If you wish, you can have subscriptions start with any issue during the spring or summer, so that you will be sure of having a complete file.

RADIO WORLD, 1493 BROADWAY, NEW YORK

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RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio and other fields. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get an eight-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands eight days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office eight days before publication. RADIO WORLD, 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

Home Builders, ATTENTION!
Are you after something new?. Do you want to construct a tuner that will allow you to experiment with circuits, and yet which is totally different in construction from any you have ever seen, and which you can make in the course of an afternoon? If so, send 15c. to RADIO WORLD for the issue of February 10, and turn to page 4. RADIO WORLD, 1493 Broadway, New York City.

Distance Reception with Two Controls.
If that is what you are after, and have not yet succeeded in finding it, send 15c for RADIO WORLD of Feb. 17, and see hook-up by G. W. May on page 11. RADIO WORLD, 1493 Broadway, New York City.

SECOND-HAND Westinghouse R. C. Regenerative receiver, consisting of detector and two-step amplifier, $65.00. Three Erla Radio Frequency Transformers, $6.00; Crosley two-step amplifier, $14.00. All of the above is good as new and will work with all standard bulbs. Address Randolph Whitehand, Albany, Georgia.

SPECIAL TUBES—UV-199, UV-201A, WD-11, WD-12, C-299, C-301, C-301A, $5.50. Radiola (RC) or (V), $120.00. C. H. Anderson, Lewistown, Montana.

ALL ESSENTIAL PARTS FOR building Neutrodyne Receiver, complete instructions, etc., $21.50 C. O. D. Reinartz tuning coils, $1.50. R. Schwartz, Buchanan, Mich.

LEARN THE RADIO CODE in 3 hours or less by the Corydon Snyder Code Method. Money back if not satisfied. 50 cents postpaid, or particulars for stamp. Corydon Snyder, 1161 So. Ridgeland Ave., Oak Park, Ill.

GET OUR PRICES on Plate and Filament Heating Transformers. L. Werts, 409 St. Julian St., Pekin, Ill.

60,000 MILES ON A HOME-MADE RECEIVER. 2,600-mile range. 100 station log and hook-up for the asking. Maitland Roach, 2908 Columbia Ave., Philadelphia, Penn.

150 FUNNY PARODIES on latest songs, 25c. Book catalog, 2c. R. W. Collins Co., 197 Fulton St., Brooklyn, N. Y.

WANTED—One K. W. used Navy Quenched Spark Gap. Also Price wanted. Harvard Radio Laboratories, P. O. Box 1781, Boston, Mass.

CALLS HEARD CARDS for DX reports. Station call in color. Printed on government postals or bristol cards. $.80 hundred up. Samples. "Used Everywhere—Go Everywhere." 9AVO, 746 So. Armstrong, Kokomo, Indiana.

MAGNAVOX TYPE R2.—Latest curver, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kans.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, tape or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

STANDARD ELECTRICAL DICTIONARY—By Prof. T. O'Conor Sloane. Just issued an entirely new edition brought up to date and greatly enlarged—Price, $5.00. The Columbia Print, 1493 Broadway, New York City.

EDISON Elements for making "B" Batteries, 6c per pair; tubes, 2c each. Nickel Wire, Insulators and Cabinets at reasonable prices. TODD ELECTRIC CO., 178 Lafayette St., New York City.

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EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

RADIO WORLD'S
FALL BUYERS' NUMBER

DATE OF IMPORTANT ISSUE—OCTOBER 3
(LAST BLACK FORM CLOSES SEPTEMBER 27)

Hundreds of thousands of radio enthusiasts who will be returning from their vacations, to say nothing of the army of new radio fans that will come into the radio fall season for the first time, will look forward to the buying of sets and general radio equipment in the autumn. Radio World will devote a special issue to these potential purchasers of goods—the **FALL BUYERS' NUMBER.**

Our regular advertising rates will be in force as follows: $5.00 per inch, single column $50, $150 per page, with discounts of 10% four times, 15% thirteen times, 20% fifty-two times (yearly) contract. Classified, 5c a word.

Special service and value to advertisers in Radio World's **FALL BUYERS' NUMBER.** All advertisers who give us copy for quarter page or more space in Radio World's **FALL BUYERS' NUMBER** will, on request, have their announcements appear in **two colors at the price of one**—in case copy is in our hands by September 22.

Radio World is already at work on a country-wide circulation campaign for **FALL BUYERS' NUMBER,** which will be so interesting from a pictorial and text standpoint that it will have an unusually large sale and advertisers will receive unusually fine value.

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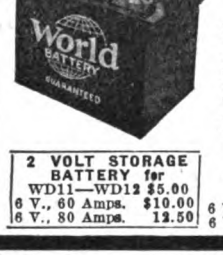
TUBES REPAIRED

WD-11 or WD-12	$3.50
C-300 or UV-200	2.75
C-301 or UV-201	3.00
C-302 or UV-202	3.50
C-301A or UV-201A	3.50
Moorehead Detectors	2.75
Moorehead Amplifiers	3.00
DV-6 or DV-6A	3.00
Also the new UV-199	3.50

All tubes guaranteed to work like new.
Mail Orders Given Prompt Attention
"24 Hour Service"
NEW DX 1½ VOLT TUBES..... $4.00
RADIO TUBE CORP.
55 Halsey Street Newark, N. J.
TUBES SENT PARCEL POST, C. O. D.

YOU SAVE 50% OF THE USUAL COST



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Batteries Are Guaranteed 2 years in Writing
Will ship C. O. D. subject to inspection, or allow 5% discount for cash with order. Order shipped same day received. WRITE TODAY.

2 VOLT STORAGE BATTERY for
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6 V., 60 Amps. $10.00
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World Battery Co.
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6 Volt, 100 Amps. $14.50
6 Volt, 120 Amps. 16.00

AN AUDIO FREQUENCY TRANSFORMER THAT IS WORTH WHILE
ALEMCO

Specially designed to produce superior results with any standard tube.
Produces maximum amplification without distortion or howling. Moisture, hard knocks and abuse will not affect its efficiency.
Windings completely surrounded with laminated iron and sealed in a non-inductive bakelite housing eliminating leakage. Adaptable to any stage of amplification.
Ratio 4 to 1
The Alemco Coil also gives equal or better results on the first stage than transformers on the market wound as high as 9 or 10 to 1.
Will stand any voltage.
Price, $5.50 Postpaid
ALEMCO, Poughkeepsie, N. Y.

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Good 2 tube WD-11 Circuit for BX.....Jan. 27
Satterlee Circuit .....Feb. 3
G. W. May's Wonder Circuit.....Feb. 17
Multi-tube Reflex Circuits.....March 3
One tube Superregenerative.....March 3
Lewis Three Tube Circuit .....March 10
Regenerative Radio Frequency Circuit for 5 tubes .....March 24
Hamilton Neutrodyne Receiver.....March 31
2VK'S Transmitter circuit.....April 21
Compact Universal Receiver.....April 28
Steinheburg Pup receiver.....May 5
Cockaday receiver .....May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Ricnartz .....May 19

Any number for 15c. Any 7 numbers for $1.00. All 12 numbers for $1.50. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

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TELEPHONE, BRYANT 4796
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FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION
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M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
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Managing Editor Stephen L. Coles
Technical Editor Robert L. Dougherty

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San Francisco—Stevens & Baumann, Inc., Holbrook Building.

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Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.
Add $1.00 a year extra for foreign postage. Canada 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES
One page: One time—$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—$5.00. Per agate line $0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days net. 3% 10 days.

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Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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A Sharp Stick Is Better Than Radio Commands for Elephants

YES, we don't care much for wireless," was the verdict of Indarini, one of the elephants of the Regent's Park Zoo, says a London cable to the New York Tribune, when an experiment was made to see whether the animal would obey the keepers' voice, coming from a loud transmitter of a wireless telephone set.

Pondering on the spread of the broadcasting craze, some zoo officials wondered whether it would not be possible for the keepers to give orders to their charges over the wireless. They arranged a demonstration, with Indarini as a subject.

At 6 o'clock Syed Ali, the Indian mahout who rules over the zoo elephants, began issuing orders in Hindustani over the radio. His first command was, "Lie down!" Indarini glanced contemptuously at the horn just outside her cage and went right on eating her potatoes.

The second command, ordering her to "Stand up," seemed merely foolish to her, as she had not obeyed the first order. While other instructions were being issued from the set she simply finished her dinner and looked disgustedly at the horn.

Then the keeper, who was present, advanced and gave the same orders. Incidentally, he emphasized them by jabs with a sharp stick. Indarini obeyed immediately, but did not even glance up when the good-night signal came over the wireless. Zoo officials have decided for the time being to stick to the old-fashioned methods.

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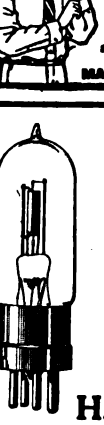

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By M. B. SLEEPER
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IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.
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Why Rita Cries

(C. Fotograms, N. Y.)

Here is a poser for you, radio fans. You should be able to tell at a glance just why Rita Kaplan, the amateur radio fan, is crying her eyes out. It is simple, and yet it is enough to make her "shed tears salty, and cry loud and long." Well, have you found it out yet? No? Just take a peek at the upper right hand corner of the receiver and you will see that one of the phone cords has come loose and the program stopped just as "——the big brown bear jump———" and incidently spoiled the entire evening for Rita, who never, never, never can sleep unless she hears her "bed-time story."

Antennaless Radio

DR. LE ROY SATTERLEE, the famed X-ray expert and radio inventor, delivered his first radio lecture from Station WOR (L. Bamberger & Co.), Newark, N. J., last Saturday night. His subject was "The Possibilities of Antennaless Radio."

Dr. Satterlee has devoted twenty-five years of his life to the development of the X-ray and he is directly responsible for many important discoveries. He is one of the half dozen survivors of the pioneers in Roentgen ray work. He owned the second Crookes tube in America and had much to do with the development work which led to the perfection of the lead glass screen now used to safeguard X-ray operators. He is also credited with making the first dental X-ray photograph and was laughed at by dental experts and physicians in dental work, though the same system is now used universally in modern dentistry.

The scientist-inventor is indeed a real martyr to his work. He has given the best years of his life, at the cost of both wealth and health, to science and humanity. At the present time he is practically an invalid. Some months ago when he was forced to abandon X-ray experiments because of terrible X-ray burns, which caused the amputation of half of his left hand and also seriously affected his heart action, he took up radio. Since then he has perfected a new type of receiver.

Among other things, the Doctor maintained that radio waves and light waves are much alike, though the latter are of a much higher frequency and shorter wave length, and claims that electromagnetic waves may be reflected and refracted by properly arranged units just as light waves may be controlled by mirrors, prisms and lenses. In the last instance his argument is very well borne out by the work being done by C. S. Franklin, in England, which Marconi himself dwelt upon so forcibly in his lecture before a joint meeting of the Institutes of Radio and Electrical Engineers on his last visit to the United States.

Franklin's work, however, deals with a system for directing the waves sent from a transmitter while Dr. Satterlee has devised a method for directing the waves within a receiver in order that they may be properly focussed upon the unit used in the secondary circuit.

A few weeks ago a series of experiments were made on board moving trains in Canada by the aid of Dr. Satterlee's receiver, with astounding success.

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Sleeper's Two Latest Radio Books

Two new and remarkably good radio books by M. B. Sleeper —one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a regenerative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for $1.00 and no extra charge for postage. The Columbia Print, 1493 Broadway, New York City.

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Send $6.00 for yearly subscription for Radio World (52 numbers) and these two Sleeper Radio Books will be sent you free, parcel post prepaid. This offer good only until September 15, 1923. If you are already a subscriber, send $6.00 NOW for a renewal and books will be sent you.

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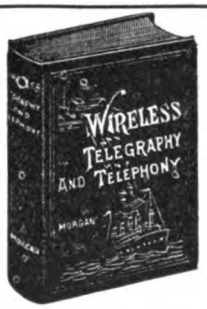

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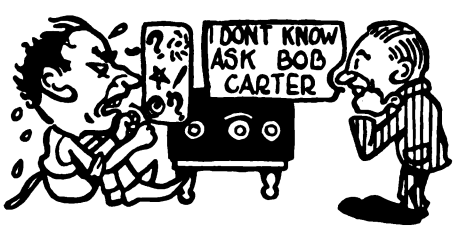
"It's easy—when you know how"

The amazing story of Bob Carter, a radio amateur, who became an authority overnight and surprised his friends

By Frank W. Daly

WHAT in blazes was the matter with the darned thing anyway? I was mad clean through. I'd been fiddling with my new set for hours and all I was getting was a weak little chorus of six stations and a lot of howls and squawks. Harry Brant was there offering his usual line of stupid suggestions which only made me angrier. "Don't stand there looking at me!" I bawled. "Why don't you **do** something? Why don't you tell me what's **wrong** with the thing?"

Harry shrugged his shoulders helplessly. "Sorry, old man, I don't know enough about Radio—you'd better ask Bob Carter, he's the authority around here these days."



"**Bob Carter!**" I shouted in derision. "What are you trying to do—kid me? Since when has Bob Carter become a rival of Major Armstrong? Bob Carter! That's a hot one. Say—three weeks ago that boob asked me if a microfarad was a disease germ."

"Just the same, Bob is an expert!" said Harry, defiantly.

"Huh!"—you've **got** to show me," I sneered. "Why don't you phone that nine-day-wonder to come over here and see what he can do with **this** set?"

"All right, I will," said Harry.

Fortunately, my sense of humor came to the rescue just then and I was able to laugh at the picture of utter helplessness I would soon be enjoying when poor Bob Carter started "fixing" **this** receiver.

Bob answered Harry's call and said he'd be right over. "—Always glad to be of service." Stupid egotist!

"What's the trouble?" asked Bob, on his arrival a few minutes later.

"Nothing much," I replied non-committally—I didn't want him to have any clues.

"Dandy set!" he commented, surveying my outfit —and I had to admit he sure handled the thing like a seasoned amateur. "There's **nothing** wrong with it," he said, after a moment, "except—"

With the ease and confidence of an experienced engineer he made some minor adjustment inside the cabinet.

"—Except **this**!"

To my astonishment WEAF suddenly burst out with a knife edge clearness and freedom from interference.

"Why Bob—" I gasped. I couldn't conceal my admiration. "Gee! You're **great**! Where did you—? How—? Say—am I crazy or something?"

Bob chuckled—he knew what I was thinking. "Pshaw! There's nothing to it." He protested, modestly. "Either of you fellows could do it in half the time it took me. Just think—I can make the **dandiest** receivers now, and trouble-shooting? Easy as falling off a log! But really—there's no credit due me **at all**. It's **easy** when you learn Radio the way I did."

I was quite prepared to believe the moon was made of hard-rubber by this time. "Of course, we aren't a **bit** anxious to know how you did it!" I said ironically.

"There's nothing much to tell," said Bob. "You remember I didn't know a **thing** about Radio, but I was anxious to learn. Still, I didn't feel like wading through miles of mathematics and verbosity to reach my goal. One day—reading a radio magazine—I happened to glance at the advertisement of the Radio Guild and saw that Kenneth Harkness had written a **new** kind of home-study book on **advanced** Radio, a book that assumed you hadn't the **slightest** knowledge of Radio, yet which dealt with the most advanced phases of the subject. This was exactly what I had been waiting for. I mailed the coupon and they shot me the book by return mail.

"Well, sir! That very first night I felt myself growing in knowledge—it was wonderful! There was no exhausting fight for understanding because everything was delightfully clear. Each subject

was taken up so smoothly I clean forgot I was studying something that had been considered ponderously scientific. Why—within the first **week** I was building my own receiver, and you ought to see it! Huh! It looks **better** than most **commercial** receivers and—well, that's all!"

I couldn't get the Radio Guild's address from Bob quick enough. I even used a special delivery stamp on my letter to the Guild. They rushed me my copy of this astounding book by return mail and eagerly I commenced reading. It was called "Radio Frequency Amplification," and if I was surprised at the knowledge Bob Carter had gained, I was even more dumbfounded at my own success. I tell you there wasn't a **question** on Radio I couldn't answer instantly and with perfect confidence. I was **absolutely sure of myself.** And as for building sets—well, I've just taken another order for a six-tube receiver. I shall make over a hundred dollars out of it. Is **that** reason enough for enthusiasm?

Now the above is a **true** story. Just think—Bob Carter was below average—yet, he became a real authority. If **he** could achieve such wonderful results in such a surprisingly short time, and with such ease—think what **YOU** could do! Yes—**you** can do better than Bob Carter. It doesn't make a jot of difference whether you've been a radio bug for years or whether you're an absolute beginner. In his new book, "Radio Frequency Amplification," Kenneth Harkness will lead you step by step from the elementary principles to the most advanced aspects of modern radio reception. Just a few minutes a day with this book and **you** will be the authority among your friends. There won't be a thing that'll stump you—not a question you can't answer.

With the aid of this book you will know how to construct the most up-to-date receivers—superior to any of the commercial sets made today. The assembly and wiring of several different types are explained thoroughly and illustrated by scores and scores of diagrams, drawings and action photographs. Could anything be simpler? Yet remember—you will be taught the most advanced and modern developments, **you will be told professional engineering secrets of manufacture never before revealed to the amateur radio constructor.**

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"Radio Frequency Amplification" with its handsome red binding, its eight meaty lessons on theory and seven closely knit lessons on intensive practice has met with an instantaneous, smashing demand! So we cannot urge you too strongly to send for your copy **today** before the edition runs out. To induce quick action on your **part**, the senders of **the** first five hundred coupons will receive this wonderful new book **AND** "Super-Regenerative Receivers" by the same author—both books for the astonishingly low price of only $1.25!

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RADIO WORLD

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ILLUSTRATED EVERY WEEK

SOME ORIGINAL AMERICANS ENJOY A BROADCAST PROGRAM

(C. Kadel and Herbert)

Twenty-seven Arapahoe Indian braves and squaws, not to mention papooses, who arrived in New York from the Wind River Reservation, Wyoming, en route to England, were entertained by a loop receiver. They gathered around it like they used to gather around the old camp fires and listened to the programs, making comment much the same as any radio wise man and woman of today will do. Those in the illustration are Mr. and Mrs. Red Turtle, Setting Eagle, White Bull and Red Fox. They enjoyed the concerts and solos much more than the talks on politics and current topics.

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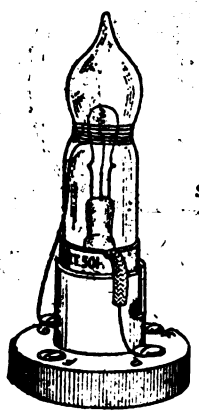

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Station WHAZ to Celebrate Its First Anniversary

RADIOPHONE STATION WHAZ at the Rensselaer Polytechnic Institute, Troy, N. Y., the oldest engineering college in America, will celebrate its first anniversary Monday evening, September 10, with a program by the same group which presented the first program when this station was opened a year ago. Dr. Palmer C. Ricketts, President of the Institute, will deliver a brief address.

Station WHAZ has already performed many unique feats. Installed through a gift of $30,000 by the Roeblings, graduates of the Institute, famous as the builders of the Brooklyn Bridge, this station was primarily intended for use in connection with the electrical engineering course at the Rensselaer Polytechnic Institute and for wireless experimental purposes, which are regularly carried out with many interesting scientific developments. It was decided to devote it one evening each week (Mondays only) to the entertainment of the radio audience, and during the cooler season its programs, which run the whole gamut of entertainment and instruction, are heard regularly from coast to coast, from Alaska to Panama, in Hawaii, Cuba and at sea.

WHAZ was one of the first stations in America heard in continental Europe last November. It was the first eastern station heard in Hawaii last December. This station established the long distance record of the world in February, when test early morning programs were picked up on four days at Invercargill, New Zealand, a distance of 10,000 miles from Troy, further than the human voice had ever been carried before without wires. It accomplished the first transcontinental two-way radiophone transmissions in January and February with station CFCN at Calgary, Alberta, Canada, with programs and messages interchanged simultaneously. A new summer distance record was made in June when a midnight concert by Doring's Band and soprano solos by Mrs. William T. Lawrence were clearly heard in complete form at Hollywood, California. Even during the periods of greatest static interference reports show that its programs are heard with remarkable clearness as far west as the Rockies, south to the Carolinas and throughout the Eastern Canadian Provinces.

In physical equipment station WHAZ is very similar to several other large stations throughout the country, operating a 500-watt Western Electric broadcasting equipment, though its location on top of the big Sage Laboratory on the crest of the hill-top campus above the city is an ideal one. Its remarkable success, however, is credited to the superior technical skill of the electrical engineering experts in charge of the operation of the station, all three of whom were pioneers in the wireless operating field and have constructed, tested and operated all manner of wireless sending and receiving apparatus. Prof. Wynant J. Williams is the engineer in charge with two instructors of the Electrical Engineering Department of the Institute, Harry R. Mimno and Leonard J. Inskip, as assistants. Rutherford Hayner is the program director and announcer.

Another "Farmer Program" from WGY

SO many requests have been received by WGY, the General Electric Company's Schenectady, N. Y., broadcasting station, for another "Farmer Program," that the studio management has arranged such a program for Thursday night, September 6. It is a novelty program, an evening in the country on the occasion of a fiftieth wedding anniversary. The Cornhuskers Orchestra will play and the Cowbell Four will sing. W. W. Norton, of Hartford, N. Y., will have a special message for the farmer and the city dweller in his talk on "The Class Conscious Farmer and Co-operation."

Sunday morning, September 2, WGY will broadcast the service of the First English Lutheran Church. The sermon will be delivered by the Rev. Herbert D. Shimer. WGY will not be in the air Monday afternoon, but at 7:40 p. m. baseball results will be announced and a concert program will be broadcast as usual at 7:45 o'clock. This program will mark the return of the WGY Orchestra for the season.

"Peg o' My Heart" will be presented Tuesday night by the WGY Student Players. The music, between the acts, will be provided by the WGY Orchestra.

At an early program Friday night a semi-classical program will be offered by Ernest Griffiths, tenor; Fred Grazaide, violinist, and John Finke, pianist. The 10:30 p. m. program of Friday will be made up of English compositions.

The Radio Dealer Year Book Will Appear October 1

THE Radio Dealer, 1133 Broadway, New York City, announces that it has in course of preparation the Radio Dealer Year Book which will contain information of vital interest to the radio business man This will include classified lists of manufacturers, list prices and trade names, a directory of radio trade-marks and a jobber's directory. The book will be published about October 1.

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There is a combined filtering action which assures perfect results when ordinary amplification fails.

It can be added to your present amplifier, giving you power amplification on the weak signals that more of the ordinary amplification would kill.

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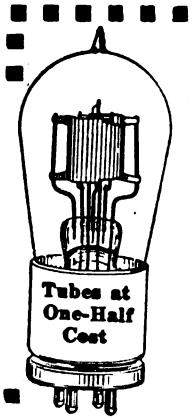
A copy of C. White's "HOW TO MAKE A POWER AMPLIFIER" is yours for the asking.



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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.

Vol. III, No. 23. Whole No. 75 September 1, 1923 15c. per copy, $6.00 a year

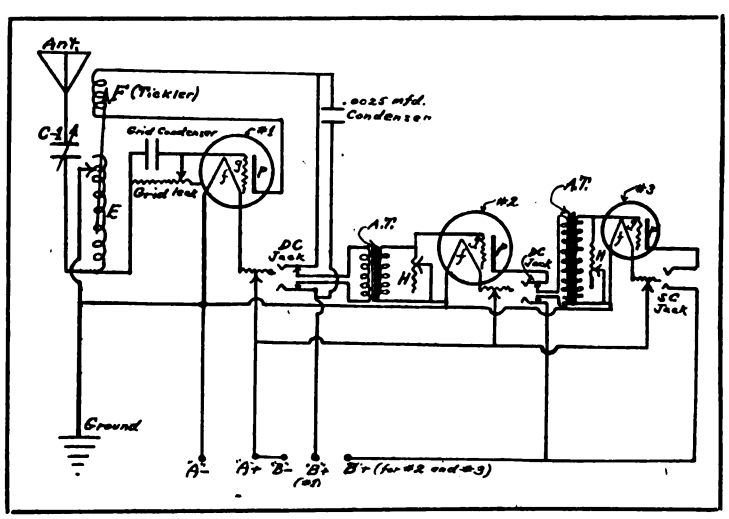
A UV199 Outfit Complete for $20

By C. White, Consulting Engineer

RADIO supplies are getting cheaper and better day by day and in every way. There is hardly any conceivable reason my every one should not have a radio set in his home and enjoy the many benefits to be derived from it. A year or so ago there were many obstacles in the road to the man who wished a radio set without any trouble or maintenance. It was next to impossible at that time to obtain a dry cell tube, and a storage "A" battery was the only economical thing to use. This meant not only the purchasing of a storage battery which in itself is quite an item of expense but also the trouble to keep the battery charged and in good electrical condition. Since last year a new tube has been developed and it is this new tube called UV-199 or C299 that has made it wholly possible to build a high grade outfit without worrying about a storage battery or rectifier to charge it.

With these new conditions in sight I have been asked by many to design a reliable tuner that would operate a loud speaker on local or strong signals. The result is the old reliable single circuit regenerative receiver with a few improvements in the amplifier circuit. While I must admit that such a circuit is not the best, it does represent a good circuit for the amateur who wants a complete outfit that will work without playing around with too many adjustments. It is not only simple but fool-proof to the highest degree. Trouble can be easily located and remedied by the man who builds it, and with care in operation you are sure to pull in distant stations with clarity and volume.

The coupler E-F as used in this circuit is not the molded type or the 180 degree type but the simple tubular type with the rotor mounted at one end of the tube. Such a coupler is less expensive than the other styles and can be used to good advantage in this circuit, although if it is so desired the molded or the 180 degree type can be employed instead. The tubular style of coupler generally has the small, or few number of turns, taps at the upper part of the tube, which is at the end of the tube nearest the rotor. Therefore by connecting up the coupler as indicated in the schematic diagram you can make use of this fact to slightly vary the tickler coupling in order to try different amounts of regeneration. It is plain to see that if the stator connections were reversed the inductance taps would be at the far end of the tube from the rotor and would only have a slight effect upon the rotor or regenerative adjustment. But care must be exercised to see that there are at least 40 turns of wire on the rotor to insure regeneration at all wave length ranges of the tuning circuit. Another feature of the set is the use of a leak resistance across the secondary of the amplifying transformers A. T. This resistance (H) is of the pencil gird leak with a variable resistance from 1,000 to 100,000 ohms, which can be readily purchased from any radio dealer handling variable leaks of the pencil style. The audio-frequency amplifying transformers will operate very much quieter with a variable leak since the input impedance of the amplifier circuit is fixed at a definite value and is not allowed to vary according to the insulation resistance and the leakage of the wiring. It is true that volume will drop just a little but the sacrifice is well worth the gain in quality and clarity of the music and voice signal.



A single circuit diagram using the UV199 or C299 tube. Note the variable high resistance leaks across the secondaries of the two amplifying transformers. These assure quiet operation and less distortion.

The jacks on the detector (No. 1) and the first stage (No. 2) are marked with the letters DC which means that they are double circuit jacks, while the jacks on the last stage (No. 3) is marked SC for single circuit or, as often called, open circuit jack. The convenience in operation afforded by the use of jacks is well worth the time and expense to install them. There is another feature I wish to call to your attention and that is the fact that the grid return from the detector tube (No. 1) is attached to the negative side of the filament. This is just the opposite to the instructions given with each

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Geological Survey Takes Radio Set Into the Grand Canyon

By Carl H. Butman

EQUIPPED with a special radio receiving set, a party of ten explorers from the Geological Survey left Lees Ferry in Northern Arizona on August 1, for a three hundred-mile trip down the Colorado to the mouth of the Virgin River at Rioville, Nevada.

Unfortunately these modern surveyors, who are following the route first explored by Major Powell fifty-four years ago, were unable to carry a radio transmitting set due to weight and space. But they are carrying a modern receiving set and will be able to hear what is going on in the world during the next three months, although they will be unable to return daily their adventures in mapping this stretch of the Colorado. Arrangements have been made, however, with the radio stations of the *Deseret News* of Salt Lake City and the Los Angeles *Times* to broadcast bulletins sent from trail crossings. The dispatches will be relayed by runners and telephone or telegraph when the party gets far enough down the Colorado to reach the regular lines of communication. In this manner the world will be advised of the progress of the exploration in the Canyon and passage of the four boats through some of the wildest rapids in the country.

The special radio set was re-constructed by Mr. R. L. Atkinson of the Survey, from a standard Westinghouse regenerative set, adapted to two stages of amplification with new tubes. The whole outfit, including the batteries, is packed in a water-proof, wooden box with sponge rubber to keep it from jarring during the long boat trip. An especially constructed antenna on a reel, capable of being erected at camp sites on the banks of the river, can be strung from short poles or from projecting rocks to a length of 150 feet.

A preliminary radio test at Lees Ferry has already been made, and it is reported that the explorers received broadcasts from Los Angeles, 430 miles away, without difficulty at night. The real reception test Col. C. H. Birdseye, who is in charge of the party, believes will come when they are in the lowest part of the Canyon, estimated as a mile deep, near El Tovar, where dead spots and static may be encountered.

Besides the geological and topographical results achieved, the trip will also prove of material interest in the development of radio communication, along with experiments undertaken by the Bureau of Mines, and other governmental bureaus, to see how far radio will carry into the "bowels of the earth."

Cheap—But Not Tinny

MANY fans want a loud talker but can't afford one, and therefore they use tin horns with loud speaking unit phones. If you get a megaphone, the fibre kind that the cheer leaders use, and put it over the phone, you will be surprised at the clearness and lack of tinny sound. And furthermore it works fine.

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tube, but I have found that better results are obtained when the return is made to the negative side instead of the positive side of the "A" battery. If you wish to find out for yourself you can easily transfer the connection on the detector grid return to the positive side which is shown in dotted lines on the diagram. Be sure to purchase a 30 ohm rheostat for each tube. A 6 ohms rheostat will not work with the new tubes since it does not afford ample control of the filament current. The tube sockets should be mounted on thick felt and the wire connecting directly to the sockets should be flexible in order to cut down microphonic hum from mechical vibrations and jars. Complete shielding of the panel is not necessary, but it will be of advantage to place a small circular shaped piece of copper foil, which is connected to the ground, on the front side of the condenser C-1. C-1 is a 23 plate variable condenser with a vernier attachment of some sort. In connecting this condenser in the circuit be sure to see to it that the movable plates of the same are connected to the Ant. terminal of the set so as to avoid placing grid potential on the shaft of the condenser which might cause howling while tuning in. All joints should be well cleaned and soldered. Avoid using too much solder and splattering the solder and the soldering flux on the panel and other parts of the set where it is not needed. You have no idea how much howling solder flux on the panel and just how much trouble a small lump of solder in the wrong place can cause. The outfit is a most reliable and fool-proof set and the only test that will be required before it can be operated is the regenerative test. If the tube (No. 1) refuses to oscillate as the coupling between the tickler and E is increased then it is advisable to try the following suggestions: If you are using a 180 degree coupler reverse the terminal connections to the rotor. When an ordinary 90 degree coupler is used this is not necessary since the coupler can be turned completely around on its axis as a general rule. Adjust your grid leak resistance, perhaps you have not the correct value for the tube used. Try varying the filament current but under no circumstances place more than three dry cells on for "A" battery to light the filament. Next raise your "B" battery voltage until the tube oscillates. If all of these fail try another tube in the detector socket, sometimes one tube will act better as a detector than the others although they belong to the same type. When tuning in place the rotor almost vertical with respect to the stator, adjust C-1 and the taps on E until the faint trace of a signal is heard. Then increase the coupling of the tickler by slowly turning the tickler (rotor) in the direction that increases the volume and at the same time slightly altering the setting of C-1 to compensate for the changes in the circuit constants due to the movement of the tickler. When you reach a point where the music or voice grows very rough or hollow, then you have too much regeneration and it is better to turn your filament down a little or take back on the coupling. If the regenerative point is over-stepped the tube will oscillate, which condition is noted by a click in the phones followed by a rushing sound like the escaping of steam. Try to tune in without creating this condition. The parts for this set complete, without tubes and batteries, will cost from $20 to $30 depending on the quality.

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A Simple Radiophone for Local Work

By Carl Masson

ANOTHER big radio season is before us; in fact, judging from the preparations which manufacturers are making, this coming season will by far outclass all previous ones. What is more, thousands of radio fans who had heretofore been termed as "broadcast listeners" are swiftly becoming radio amateurs.

What is still more, many amateurs, who have mastered the art of producing sounds from ether waves, will want to generate waves of their own. In other words, hundreds of radio stations will install equipment to "talk" in addition to receiving sets, and the radio inspectors will have to issue many new licenses.

With these predictions in mind, the author presents herewith a radiophone transmitting outfit of unusual simplicity, and costing very little to make.

The days of the spark coil sets ("squeak boxes") are gone forever, and C W affords wondrous opportunities for the amateur to smash all records.

The accompanying illustration, which appears to be a receiving set, shows the layout of the parts comprising this outfit. The loose coupler is a medium-sized one, the variable condenser is .001 in capacity, and is preferably an enclosed one. A standard V. T. socket, an ordinary filament rheostat and binding posts as marked, plus the microphone, tube, and batteries, are the few parts required. All parts are mounted on a woden base as shown in the illustration.

The tube used is one of the hard amplifying type. The "A" battery is the regular six volts. Four "B" batteries connected in series supply the plate voltage.

An antenna of the "T" type will give the best results for transmititng. Tunning is accomplished with the loose coupler and the variable condenser. Rough adjustments are made with the coupler and fine tuning is done with the variable condenser.

Though the transmitting distance of this outfit is limited, it is ideal for the beginner. The diagram shows how the instruments are hooked up, which, I am sure, is self-explanatory, being so simple.

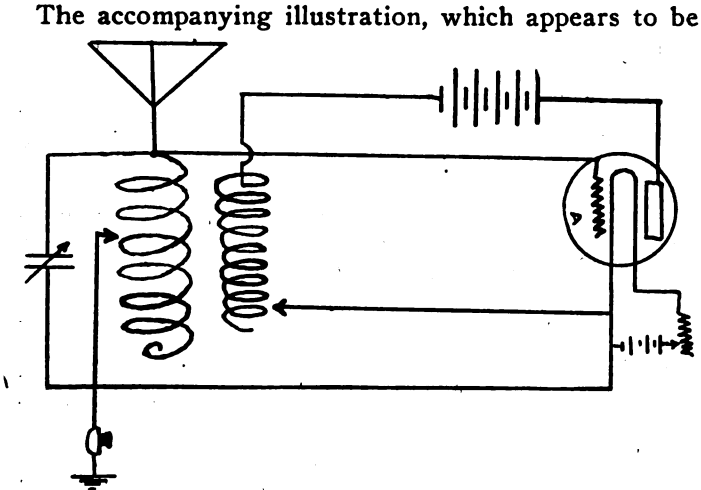

Fig. 1. Circuit diagram for a simple home-made radiophone.

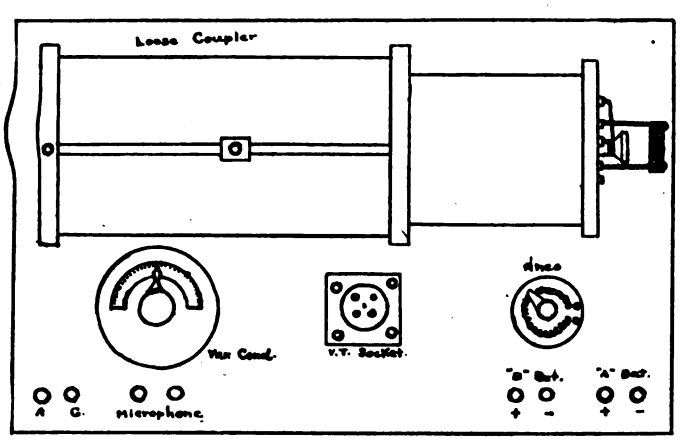

Fig. 2. Suggested location of apparatus on baseboard.

500 Miles on an Indoor Aerial

By Arthur G. Shirt

MANY radio enthusiasts who find it impossible to rig up an outdoor antenna have given up the idea of owning a radio receiver for themselves because they doubt the efficacy of an indoor aerial. The average loop aerial, of course, is almost out of the question for the radio novice, because its use demands very sensitive receiving apparatus of a make and cost far in advance of the humble desires of the average owner. With a single tube set, a loop is a very critical aerial, and can be successfully operated only with a few special hook-ups and then with more than ordinary skill and care. But with an indoor aerial of the type described below, all these disadvantages are done away with, and concerts come through with the clearness and volume of an outside aerial.

Many amateurs use the lighting circuits of their homes as radio antenna. However, it is not necessary to use a condenser plug, as recommended by most users of the lighting circuit antenna, if you take the radio impulses from the circuit by inductance. Running from the aerial binding post on the panel, use an ordinary piece of lamp cord—that is, two pieces of insulated wire twisted together. One wire is connected to the inside connection of the light socket, the other end of the same wire being taped very securely to prevent a contact with the set. The other wire connects to the aerial binding post, and the unused end of this wire is also taped to prevent contact with the light socket. With this arrangement, there is no direct connection of the set with either of the two wires of the lighting circuit, yet the device works, and it works well. The originator of this system says that his set is almost noiseless and that stations which before came in weak now come in loud and clear.

The current is always turned on while the set is in operation, but, of course, there is no consumption of current. The average working range of a single tube regenerative outfit, using the lighting circuit as suggested above, is 500 miles. There is no danger in this novel arrangement, either to the lighting system of the house or to the radiophone receiving set.

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Direct Radio Service to United States from Holland and Italy

By J. L. Bernard

FOR the first time in the history of international communications, direct radio telegraphic service between the United States and the Hague, Holland, and between the United States and Caltano, Italy, was established last week according to an announcement made by the Radio Corporation of America. The opening of these services raises the total number of direct radio circuits radiating to European countries from New York City from six to eight circuits and affects not only Holland and Italy but provides more direct routes between the adjoining countries and the United States.

The addition of these new circuits to the already existing channels of radio communication to many parts of the world materially advances the status of plans which are now being worked out by the Radio Corporation to make the United States the centre of a world-wide radio communication network. Because of the centralized location of the United States, with Europe to the east, South America to the south and the Orient to the west, this country enjoys a natural advantage which helps to make it possible to link the principal nations of the world by radio around New York as the pivotal centre. This plan is rapidly nearing completion, there being at present eight connections across the Atlantic and one bridging the Pacific.

The circuit to Italy is one of the longest in existence. The distance which the radio waves travel in connecting the two points in communication is over 4,500 miles, or one-sixth of the way around the globe. In bridging this distance, however, the element of time is a negligible factor, it requiring but one-fortieth of a second for the signal flashed in New York to reach Italy. The distance traveled by radio waves between the United States and Holland is 3,500 miles.

The Italian Government has for many years expressed a desire to have direct radio service with the United States. Not only will it be highly beneficial to that country, but Italy will now be in a position to render an effective service to neighboring countries by placing the use of her radio station at the disposal of Sicily, Hungary, Servia, Greece and other neighboring countries and thus provide more rapid and direct contact between these countries and the United States. The more intimate relationship created by the new radio service will greatly enhance the trade interests between all the countries affected.

The geographical location of Holland with respect to Belgium, Finland and Denmark gives to Holland a similar advantageous position whereby she may handle communications to and from these countries with maximum dispatch. Thus these two new radio stations provide an outlet for business and social traffic between many European countries and the United States, according this nation a unique and powerful position of commercial and political prestige in the affairs of foreign nations.

In commenting upon the new service General Harbord, president of the company, said: "Direct communication between the United States and Holland and between the United States and Italy has long been the dream of our friends across the sea. The opening of this remarkable service will link in a more perfect bond the business and social friendship of these peoples and will assist in bringing about the stabilization of trade conditions which depends so largely upon swift, reliable and direct communication. This achievement is a monument to the skill of the Holland and Italian Government engineers with whom our engineers have been closely co-operating for several months in an endeavor to perfect methods for annihilating space and time in the exchange of intelligence."

The transmitting station which engages in communication with the two stations abroad is situated at Rocky Point, Long Island, 70 miles from New York City. The antenna system of this central station is so large that a plot of 6,400 acres was required on which to erect the towers. A system of private telegraph lines joins the control apparatus of this station with the operators at the Broad Street offices of the Radio Corporation where the actual telegraphing is performed. The receiving station is located at Riverhead, seven miles east of Rocky Point, and in a similar manner the receiving operator at Broad Street receives the signals intercepted at Riverhead and transcribes the dots and dashes as they are received by him. This system of remote control of high power radio circuits is a strictly American innovation which obviates all the disadvantages of stations located in a city where various atmospheric disturbances seriously interfere with its efficient operation.

Reward for Message from Captain MacMillan

RADIO WORLD has received the following telegram from WJAZ, the Zenith Edgewater Beach Hotel Broadcasting Station, Chicago:

"MacMillan expedition has not been heard from since July 27.. Many are worried, but we do not think it strange, as his ship, 'Bowdoin,' is not only in continuous daylight but is inside auroral band. He will have no darkness until September. Reception is difficult for him under these conditions from low-powered transmitter necessitated by the limited space on his ship.

"However, we will present gratis to the first Canadian or American amateur to deliver to us the next message from Captain MacMillan a complete Zenith standard receiver and amplifier, a duplicate of the MacMillan set. This is done to electrify interest generally."

Don't Do It Half Way!

WHEN constructing a set you will probably carefully solder all connections, and then neglect to solder your antenna wire connections and ground connection. The energy picked up by the antenna is so extremely small that it is a waste of good work to put up a fine 100 or 150 foot antenna and then neglect to get even a quarter of the actual energy out of it by not soldering each and every wire, or else hand splicing them like rope. Don't do it only half way—go the entire route.

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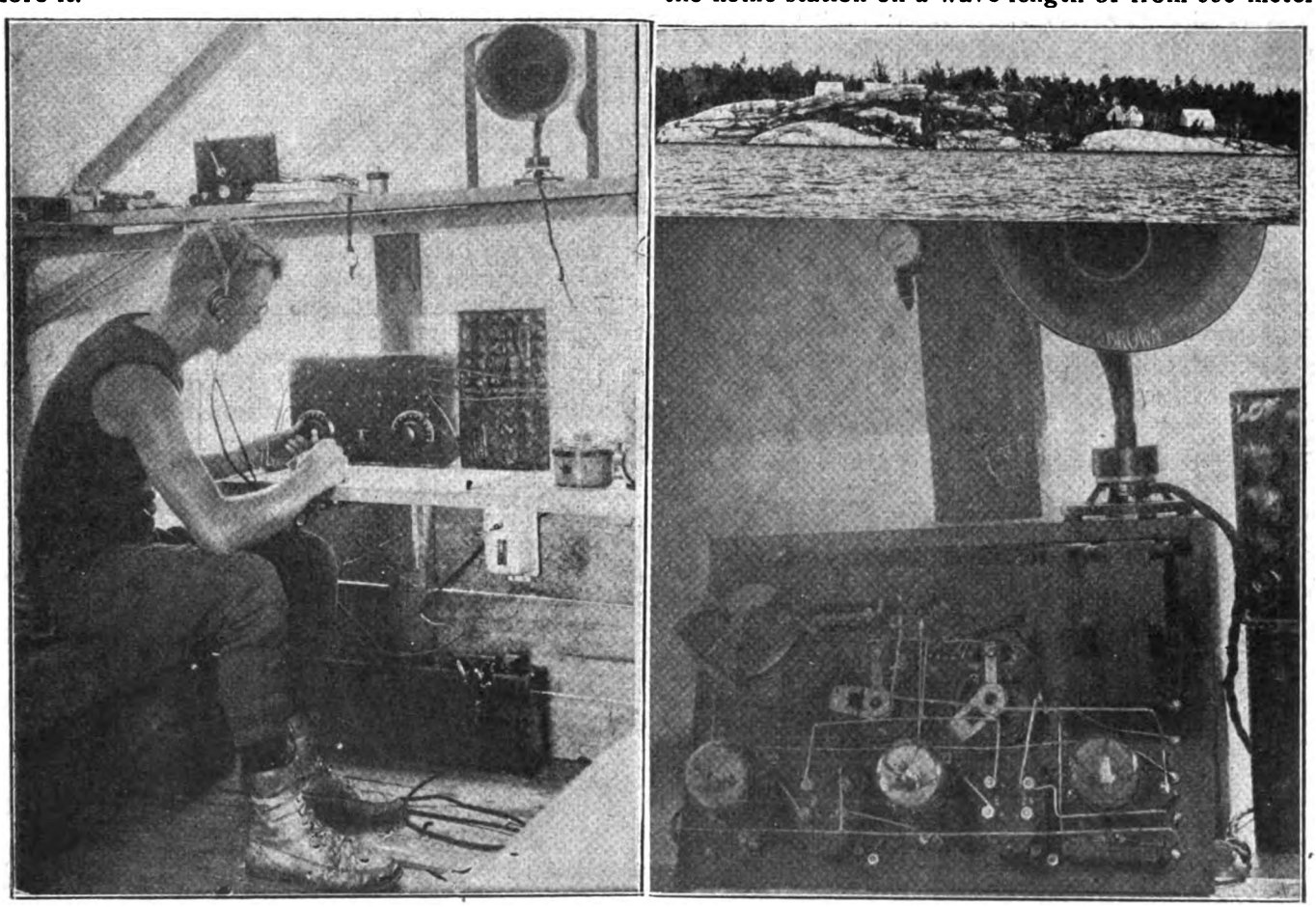
Fighting Forest Fires with Airplanes and Radio

By Campbell MacDougall

PROBABLY the most serious business in the Canadian wilds and forests is the fighting of forest fires. Canada employs a picked staff of men to watch out for fires in their great uncharted wilderness and fight them. Were these men not on duty, forest fires, due to lightning and camp fires left burning or smoldering, would devastate the vast forests of Canada in no time. A person who has never seen a forest fire cannot imagine the peril of it. It sweeps forward under a breeze like the hand of death destroying everything before it.



(C. Paul Thompson)

William Robinson and his receiving station on Ramsay Lake, Ontario, listening in for fire alarms. Receiving set designed and used by Robinson, and, above, the location of the station.

In order to cope with this terror, the Canadian Government has equipped her fire fighters with airplanes. These scout around, spot the fire and report it to headquarters at Ramsay Lake, Ontario. Up to a short time ago, the planes relied upon their speed coupled with manual signaling devices to advise headquarters. They would spot the fire, take the location and then fly post haste back to the station.

As an experiment they tried installing radio sending and receiving sets on the planes and at the station. The planes are of the SE type, and as yet not all of them are equipped with radio. The receiving and transmitting sets are located in the forward cockpit of the plane, and the antenna is of the hanging type used in most planes. Current for the operation of the sets is derived from a wind driven generator located on the wings of the plane.

William Robinson, who is responsible for the planes and rangers' offices being equipped with radio, is the chief radio engineer of the Laurentide Air Service. The sets were made by him and were specially constructed with a view of the service to which they would be put.

The method of fighting these fires is novel in itself, inasmuch as the planes themselves and their pilots cannot land in the heavily wooded sections. They call the home station on a wave length of from 550 meters to 900, advise it of the location of the blaze according to a map and then hurry off after getting an answer.

Then the rangers, who are scattered throughout the woods many miles from the station and may be hundreds of miles from the fire are called by line phone and start for the location of the fire.

Mr. Robinson's set is a regenerative receiver, consisting of detector with two stages of audio-frequency amplification. Because of the fact that the particular locality is a "static hole" it is impossible to use any additional amplification.

Besides being of value as a fire fighter, radio also relieves the terrible loneliness for the rangers. They beguile their dull nights by listening into the local and distant broadcasting stations, while waiting for their radio call to duty.

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Swallows Interfere with Broadcasting

By Washington R. Service

EVEN the birds in Washington, D. C., are radio fans, and their insistence upon attending broadcasting events is causing some of the local stations considerable embarrassment.

Engineers of the Chesapeake & Potomac Telephone Co., broadcasting station WCAP, found themselves in difficulties during the broadcasting of the dinner given to Paul Whiteman in New York, received there by land wire from WEAF, because of the antics of swallows which had settled upon the station's antenna.

Shortly after the program began the wave length of the station suddenly increased from 469 to 479 meters, the vacuum tubes in the transmitter began to heat up and the plate current increased tremendously. In order to save the tubes it was necessary to reduce the plate voltage from 1,600 to 1,450 volts, but even after this reduction was made the plate current was 850 milliamperes instead of the normal 700 milliamperes.

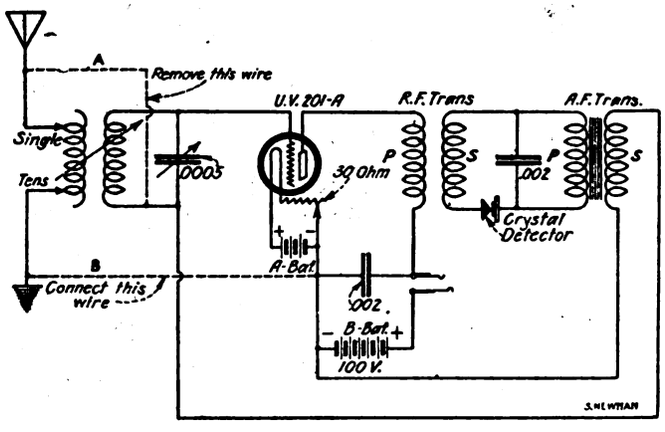
Emergency apparatus was placed in readiness for immediate use, as the engineers scurried around seeking the cause of the trouble. One of the men went out to look the antenna over, and almost fainted to see a flock of swallows calmly roosted on the wires. The lead-in wire was shaken sufficiently to cause the unwelcome radio fans to seek some other resting place for the night, and conditions in the operating room returned to normal.

The experience is believed to be new in the history of radio broadcasting. Engineers of Station WCAP explain that the size of the antenna was increased by the size of the birds' bodies, thus increasing the wave length and causing a greater current to flow. They deny, however, that the birds were attracted to the antenna for a feast of mythical "wire worms" or that they are in the market for a radio scarecrow. Inventors are said to intrigued by the possibilities of the case.

Curing Induction in a Reflex Set

By Earl A. Wright

AFTER having constructed an Erla reflex circuit, as invented by the Electrical Research Laboratories, I found it to be the best little one tube set I had ever tried. The tone and volume was equal to two tubes, but the circuit was very noisy, due to the electric light wires. This caused a very disagreeable hum in the phones, and it was loud enough to hear all over the room.



Easy method of curing induction in a reflex set.

I tried to rid my set of this noise by moving it to different parts of the house. The noise always pursued me. Then I opened the light switch outside, and the hum stopped and everything became as clear as a bell. This showed my set to be picking up the A. C. induction from the wires in the house. The closest wires were about 20 feet from my set.

I had been watching the question and answer department of all the radio magazines I could get, thinking I could find the answer to my trouble. Many times I ran across the question "How can I stop the hum in my reflex set?" and the answer was, "Run your aerial at right angles with the power wires." This, of course, would help if the aerial happened to be close, and running parallel with the wires. But it didn't answer much for me. Grounding the negative side of the A battery will stop the hum in ordinary circuits, but grounding the A battery in this particular reflex circuit would unbalance the whole thing.

Finally I stumbled across a way to stop it. It was so simple and easy, and worked so well, I thought there must be many reflex fans throughout the country who would be glad to try it, so I am giving the little secret to RADIO WORLD. Of course, I do not know how it will work on other reflex circuits besides the Erla. But I think it will be about the same.

It is only necessary to change the circuit slightly, as shown in the diagram. Remove wire "A" and connect wire "B" in the circuit. That's all there is to it. The set will now be very quiet, and everything coming in will be as clear as a bell. This circuit, if properly adjusted, will operate a loud speaker.

Radio a Boon to Alaskan Light Keepers

RADIOPHONE communication between light stations in isolated territory has been found very successful by the Lighthouse Service, according to reports to the Department of Commerce. Complete stations were installed at Cape Sarichef and Scotch Cap Light Stations, Alaska, in 1921, and after overcoming some difficulties of operation during the first year, due to burnouts of the motor-generator and wrecking of one of the steel antenna masts by a storm, communication between the stations has continued uninterruptedly for the past year, which has been mild.

The two stations are about 17 miles apart. Keepers at both station have mastered the code, so as to be able to exchange messages with mail steamers, and have been able to communicate for a distance of 65 miles by voice and 165 miles in code. The telephone installation at these stations consists of a type C. W. 936 short range radio telephone set, two three-fourths K. W. 32-volt Delco engine-driven generators, two 70 ft. steel poles and the antenna and ground system.

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Here's a Great Loop for a Crystal Set

By Kenneth Malcolm, A. I. R. E.

WHILE visiting a friend in Brooklyn, N. Y., the other evening I was asked to listen-in on his radio set. Immediately upon donning the receivers I could hear WOR broadcasting a very fine 'cello solo. The clarity and the audibility were remarkable, and I asked my friend what kind of a tube he was using. He replied that he wasn't using a tube at all, but a galena crystal. Noticing the unusual freedom from static on such a hot night, I inquired the

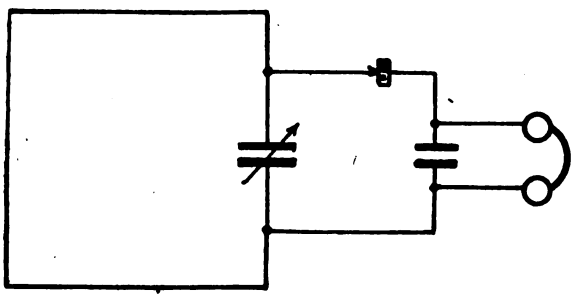

Fig. 1. Circuit diagram for a crystal receiver using a loop antenna as described in the accompanying article.

type and size of the aerial. To my surprise, I learned that there was no outdoor aerial at all, a large loop indoors doing the trick.

Immediately I thought I should tell the readers of RADIO WORLD about this feat, so that those who had crystal sets could make good use of the idea during the summer months. Before, I had been rather shaky about recommending loops for crystal set users, but now I give them whole-hearted endorsement. Of course, they cannot be expected to give the results of

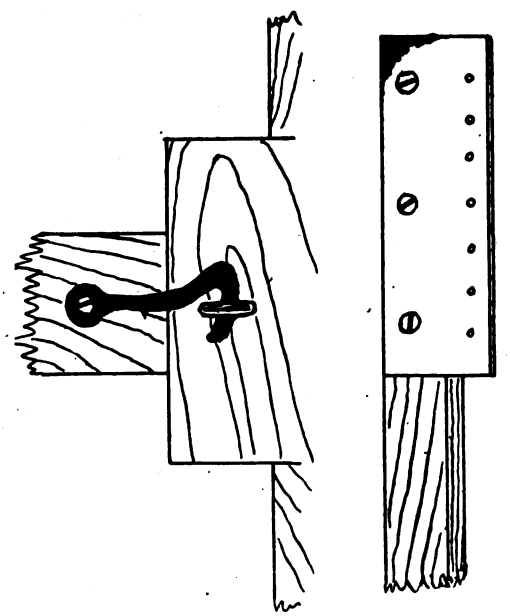

Fig. 2. Method of fastening cross arms so as to keep them rigid when used, or allow them to be conveniently folded. Also details of bakelite strip used for supporting wires.

an outdoor aerial, but for sets that are within ten or fifteen miles from a broadcasting station, they would probably allow good reception at times when by other means it would be impossible. The secret of the whole affair is to get the loop large enough for fair efficiency. The loop mentioned was rather cumbersome, and in the way when not in use, but the one to be described will for the most part do away with that disadvantage.

Secure four lengths of wood 3' long, 1" wide, and ½" thick. Also, a good hardwood block 2½" square and ½" thick. Purchase four brass hinges having a width of an inch, and four flat hooks with eyes to match. Four strips of bakelite ⅛" thick, each 1" wide and 4½" long, and about 140 feet of wire, completes the material list.

Sandpaper the wood strips, and see to it that the ends are perfectly square. Now you may give them a coat of stain of the desired color, and then several coats of shellac or transparent varnish. Do the same with the center block. Next you may fasten a hinge to one end of each of the strips; do this so that the hinge may double up toward the part that is fastened. The correct way is shown in the accompanying drawing.

Now take each of the bakelite strips and drill a series of seven 1/16" holes, ½" apart in a line ¼" from one of their edges. Near the other edge, drill three holes to take the fastening screws. When this is done, one may be screwed close to the outer end of each of the strips, with the edge having the seven holes, pointing toward the face on which the hinge is fastened.

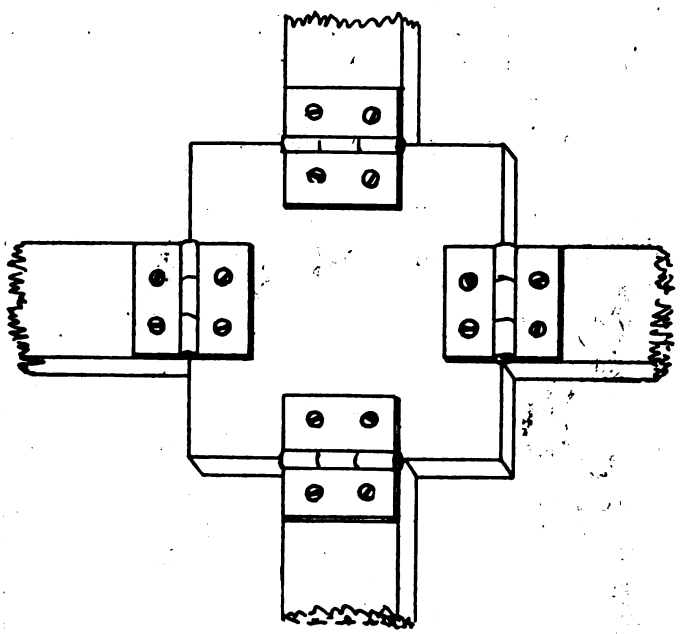

Fig. 3. Manner of placing hinges on ends of cross arms and center piece to allow them to be conveniently folded when desired.

The other ends of the strips may now be fastened to the center block as shown. The ends of the strips should be tight up against the edges of the block. Turn the whole affair over, and on the other side of each strip, fasten a hook and a screw eye so that the loop frame will be held open and rigid when in use.

The wire may now be threaded through the holes. There should be seven turns in all. Most any wire will do for the purpose, but a stranded wire such as lamp cord or Litzendraght would be the best. If you use lamp cord, it might be necessary to make the holes in the bakelite strip a little larger.

On account of its large size, it will be found that the loop can usually be better suspended from a chandelier or something of the sort, than mounted on a base; and

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A Literary Broadcasting Station

By A. Stone

THE literary world has one of the most powerful allies on its side in the form of radio. Through the means of this remarkable invention of man there is no work of pen that is not within the reach of any person who is fortunate enough to own a radio set. It has often been said that the price of important literary works has been prohibitive for the person of small means, that libraries do not often extend the proper facilities for placing the books most in demand before those persons who frequent them, but it seems to me that radio, with such an elasticity of range quite easily overcomes these two main objections.

When broadcasting stations begin rendering such service as quoting from Shakespeare, reading from the Bible, announcing in serial form Well's Outline of History or reciting from Kipling and other famous poets the general public will quickly realize just how important radio is in disseminating literary information broadcast.

At the present time the various broadcasting stations are now rendering a diversified service—that is, their programs not only consist of music but of sports, news, lectures and any other items that might be of interest to the general public. As far as I know there is yet to be established the first broadcasting station that deals exclusively with one subject. There are no broadcasting stations that send out news exclusively; there are no stations that devote their activities exclusively to music; there are no stations that devote themselves exclusively to lectures.

The station that I am to construct at Milton-on-the Hudson, N. Y., this fall will be a new departure in broadcasting. I am going to use it exclusively for literary purposes and lectures. I will invite the most eminent men and women I know to visit the station and to talk on famous books and other literary subjects. I shall also try to have authors read their own original works for the benefit of the large radio audiences that I know would be willing to set aside a few hours each week to listen in on subjects pertaining to literature. From time to time I also plan to use the broadcasting station for the purposes of lecturing on some popular subject pertaining to literature.

There have been so many inquiries coming to my home concerning the broadcasting station I am preparing to build, as the result of the wide publicity the original announcement received through the columns of RADIO WORLD, that I am once more taking advantage of this opportunity to state that the station will not be in operation for several weeks as I am still obtaining data that will enable me to establish a station of sufficient power to answer my purposes. I hope, therefore, that the many radio enthusiasts who have written me commending my efforts to establish a broadcasting station with such worthy purposes in view, will be patient.

"Radio World's" Transcontinental Tour

Arthur G. Shirt and RADIO WORLD'S Transcontinental Touring Car.

UNKNOWN to our readers in general, RADIO WORLD went on a transcontinental trip this summer in the person of Arthur G. Shirt, friend and radio adviser of thousands of our readers, and "Radio World," the car.

How this was done is easily explained by the photograph. A. G. Shirt and "Radio World," the touring car, traveled across the United States via the Lincoln Highway, a distance of approximately 4,500 miles. Many people met both the voyagers and after knowing them embraced them in a truly long lost friend manner.

It is said that "Radio World" appealed to everyone, its pleasing personality, and never-tiring "voice" appealing and enlightening approximately 5,000,000 people as to the whereabouts of the best radio weekly.

Mr. Shirt is returning, browned and happy, from a summer in the great outdoors. He says he feels like a two-year old and is "rarin'" to go back to writing.

(Concluded from preceding page)

this easily may be done by fastening a screw eye in the end of one of the wood strips, and fastening a cord through this. When not needed, the loop may be folded together and stowed away in the corner of some closet.

With the loop described, an entire receiving set is not necessary, but simply a variable condenser, a crystal detector, a phone condenser, and a pair of phones. They should be connected up as shown in the circuit diagram.

To get your station you simply adjust your detector, slowly turn the loop, and adjust the variable condenser; nothing could be easier. If you have all good parts you ought to get really surprising results.

Such a large loop could be used also with a single vacuum tube to advantage. The hook-up to be used in this case would be the same as that published in RADIO WORLD for May 12, 1923. Here you would get almost as good audibility as if you were using a long outdoor aerial, and the selectivity would be much improved.

Large loops are not quite as directional as small ones and the tuning is not as sharp, but they offer more surface to the incoming waves and hence their energy absorption is greater. The effect of this is more pronounced in the case of crystal or non-regenerative sets.

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Government Radio Work Needs More Money

By Carl H. Butman

WHEN the next session of Congress takes up for consideration the appropriations to be made for the conduct of the Federal Government during the coming fiscal year, a greatly increased appropriation will be asked for the operation of the Radio Division of the Department of Commerce, which today is struggling along on funds but little greater than those available three and four years ago when broadcasting, as we know it today, was non-existent.

If the Radio Division is to perform its functions efficiently, at least $100,000 more than is now appropriated will be necessary, it is believed. A greatly increased force of inspectors is needed if the broadcasting stations and amateur plants are to be checked up properly. At present practically all of the time of inspectors on the coast is required for the inspection of ship stations and similar government work, and they are hard pressed for the time in which to make these necessary inspections of other stations. The recent re-allocation of wave lengths, however, makes it necessary that every station be extremely sharp on its wave, if there is to be no interference, and careful checking up of the wave length used is necessary.

Few persons not connected with the work of the Department of Commerce realize what the district inspectors are doing. Many of them are out of bed and ready for their day's work before the last "ham" has signed off for the night. They travel great distances; most of them have automobiles for facility in covering their territory and run the speedometer up many thousand of miles in the course of a month. All sorts of work come to the radio inspectors; the checking of broadcasting stations and the inspection of ship plants is but a part of their labor. Many complaints are received, some well founded and some imaginary; but all must be investigated, at a great expense of time.

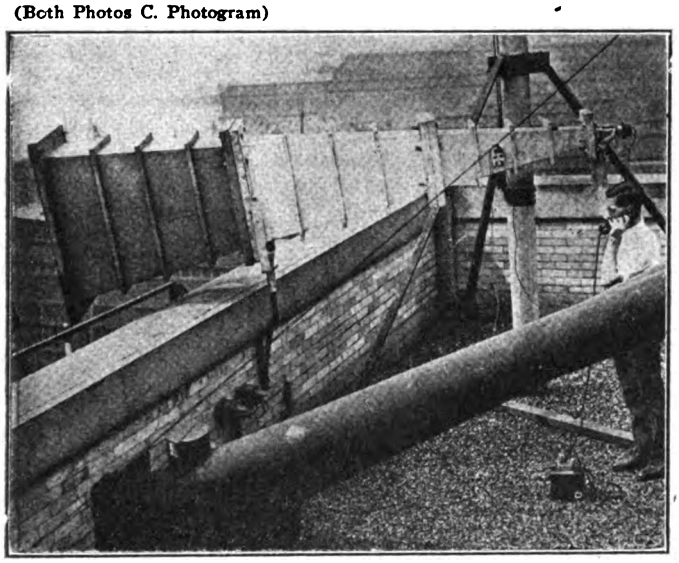
Practically every inspector is overworked, and it is the desire of officials in Washington to give them such assistance as may be necessary for them to carry on all of the many operations which go to make up an inspector's day. At the same time the Washington offices are none too well supplied with labor, and hard work and long hours are necessary for the handling of the great mass of data, reports, complaints, letters, applications, etc., which pour in in a steady stream.

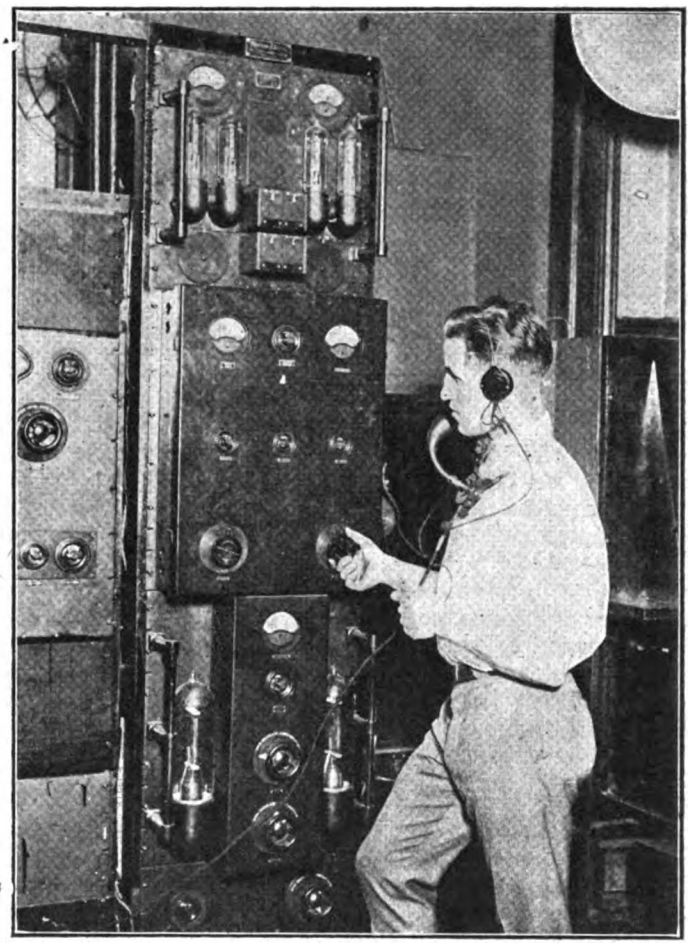
Western Electric Roars Farewell to Holmgren

BY means of the huge amplifying horn and speech amplifying device located at the Western Electric Company's plant on West Street, New York City, the officials of the company were able to say farewell to A. Holmgren, Director of Research of the Royal Swedish Telephone and Telegraph Company, after a visit to the Untied States.

The illustration at the left shows the huge 10-foot horn which carried the voices across the river to the boat on which Mr. Holmgren was sailing. The power amplifiers used are shown at the right.

(Both Photos C. Photogram)





Makes It Work Smoothly

A LITTLE vaseline lightly rubbed on the switch-points of the receiver will make the arm slide easily over the points and obviate any chance of friction wearing the points down. The fact that it is an oil base product does not affect the electrical contact in the least, but if anything, makes it better. Along the same time, a drop of oil on the bearings of the condensers makes the rotor turn smoothly, if too much is not put on.

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Radio for the Farmer and the Rural School

By Kenneth M. Swezey

THE greatest hindrance to development and civilization is isolation. Africa is in the place she is now in today because of her previous inaccessibility. China, Persia, and the rest of the Far East are mouldering in the remains of a civilization of centuries back, simply because they shut off the rest of the world with its new ideas. The farmer of our own country has until recent years been held back by the same conditions, by the separation from his city brothers necessitated by his location and inadequate means of transportation and communication. The extension of the railroads offered him his first chance to keep pace with the outside; and the automobile increased this possibility manyfold. Today, radio broadcasting makes the link which—in addition to the railroad, automobile, and telephone—gilds the farm as attractively as it does the city. The farmer needs no longer be bored by solitude, miss the frivolity of city life, lose crops on account of insufficient information, nor be deprived of a high grade education. The acquisition of a radio receiving set will bring knowledge, entertainment, comfort and pleasure right into his home.

Just what can radio do for the farm home, and what are the easiest means to the end? First of all, a radio set would be a social advantage. It would acquaint the rural citizen with the doings of his neighbors and his friends of the city. It would bring to him the music, the literature and the wisdom of the outside.

Who can repress the thrill that come when listening to the sextet from "Lucia," the purifying quiescence of a violin rendering of Massenet's "Elegie," or the longing remembrance occasioned when a soft but mellow tenor voice carries the strains of "When You and I Were Young Maggie"? The classics in music are character builders beyond the shadow of a doubt. Yet, before this time, what chance had a farmer to hear an opera, or even a selection from one, except on the phonograph? Now, things have changed and he has but to tune in to get the food that will feed his deeper self and make him a better and stronger citizen.

The younger generation of the country are as much addicted to jazz as are the finale-hoppers and flappers of the city. And radio affords an admirable means to keep them in their own community by bringing to their Town Hall the famous jazz orchestras of the big cities. It also keeps them posted on popular music.

Radio bring the governmental representative and the others in office and introduces them to the farm. No longer can the farmers be hoodwinked and dumswiggled into voting for some one they do not know, on the basis of soap box orations and unscrupulous mail propaganda. Radio puts them in direct touch with the administrators whom they pay to look after their welfare and the whole business becomes personalized and "man to man." The wideawake man on the farm, with his radio set, can be much more well informed than can an indifferent man in the city.

To those in the more remote localities the Sunday radio services are a boon. Deprived of all but an occasional attendance at church, the isolated farmer rejoices at a chance to hear the hymns of his faith sung by noted soloists, or famous choirs, or played by an artist on a priceless organ, to hear an inspiring sermon from the lips of a worthy preacher. All this is something new and wonderful to him.

Even in small communities where they have a church, the members are not always able to pay a regular minister or to pay for any music, save that which is furnished from among themselves. Here, a radio set with a loud speaker serves effectively. Either it replaces a regular minister entirely, or is used in emergencies.

Radio has also a great educational value. Listen in on any program, and you will usually find that some educator has been included, someone who will leave you with more knowledge than you had before. Possibly it is an explorer who has just returned from the heart of Africa who tells of the animals, the vegetation, and the living conditions there. It might be some scientist trying to explain the Einstein relativity theory. Or it might be some teacher leading his radio class in the more practical study of stenography, language, domestic science, or one of a thousand other things.

As an adjunct to the rural school the value of radio cannot be overestimated. Just as a distant minister can be brought to the church, so can a teacher be brought to the school. In fact, a different teacher could be procured for each subject, whereas formerly a single resident teacher had to do all the work as best he could. When a definite system has been worked out, a staff of competent teachers could be kept at central points, and their instruction could be broadcast to all the small schools within hearing distance. A single teacher could be kept at these small schools to offer whatever personal guidance is necessary. In this way the expense would not be materially increased, and at the same time the pupils would be getting the best of high grade instruction. Of course, the resident teacher cannot be entirely dispensed with, but radio can bring personalities into the classroom that would not otherwise be available.

A class on civics could be taught admirably by radio and the leaders of the country could themselves be the teachers. What would inspire patriotism in the hearts of the country's youth more than to hear the voice of the President, his cabinet, and the minor executive and judicial heads? Soon Congress will be hooked up to a broadcasting set and the proceedings, as they occur, will be broadcast to the country. Important conventions and the like will be broadcast also.

Radio music could be well brought in as a part of the school curriculum. It would acquaint the pupils with the composition, composers and musical artists of our nation and of others.

Economically, radio is in to do its part for the farmer. It is the speediest and most accurate crop bulletin that ever was or ever will be devised. The Department of Agriculture sends crop reports daily from a number of big stations, covering territory all over the country. This is of inestimable value. Then, too, the weather reports that are sent out daily are not to be disregarded. These help the farmer to "make hay while the sun shines." One writer has recently acclaimed radio as the "Voice of God" to the farmer. Whether it be this or no is not to be disputed, but it certainly is becoming a beneficent and indispensable part of farm life.

Is it possible for every farmer to own a radio set in the near future? Yes, it is possible. And as soon as they become innoculated with sufficient virus of radio bacilli, and fully understand their possibilities, they will have them. There is no doubt about it!

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A Home-Made One-Tube DX and Loud Speaking Receiver

By Byrt C. Caldwell

THIS receiver is an especially good model of the reflex receiver which is so popular now. To the owner of a regenerative set the reflex is a revelation. There is absolutely none of the howl which is so apparent in regenerative sets. When tuning, there is no whistling of the carrier wave and no distorted tones. Music and voice are tuned in strong and clear without the troublesome work of clearing out the "music" which is experienced by most fans. The quality also surpasses that obtained on the regenerative receiver. Control is much simpler and the reflex is much more sensitive than the regenerative receiver. By all this I do not mean to belittle the regenerative receiver. Wonderful results are, of course, obtained on this set by an experienced operator, but for the beginner the reflex is undoubtedly the best—for him and for his neighbors.

The writer designed and built the receiver which is described here. There is some slight variation from the standard reflex circuits but these changes are for the better.

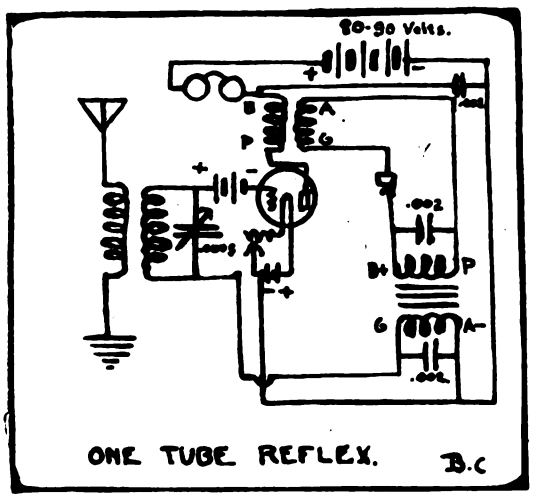

Fig. 1. Schematic diagram of a one tube reflex that can be made to work a loud speaker.

The arrangement of the instruments on the panel and base is shown. No wiring is shown in this diagram, as it would lead to confusion. All of the instruments are arranged so that the shortest leads possible can be used. A two-plate mica dielectric condenser was used by the author but this is not absolutely necessary. The tube socket is mounted directly in back of the "window" and the socket for the radio-frequency transformer is mounted back of this. The audio-frequency transformer is to the right of the R. F., and the crystal detector, which should preferably be of the fixed type, is placed between the two, directly underneath the B+ of the audio transformer. A .002 fixed condenser is mounted across the secondary, and one across the primary of the A. F. transformer. One is also connected directly to the positive B battery binding post. The grid battery, which must be used for the UV199 and C299 tubes, and is used to advantage with other tubes, is placed as close to the grid terminal of the tube as possible.

When wiring use bus wire if possible and make all connections as short as possible, soldering all contacts. Run wires at right angles to each other whenever you can, but do not attempt to make a good-looking job by running all the wires so as to make perfect right angle bends. The wiring of the set should be done for efficiency and not for looks. Right angle bends look

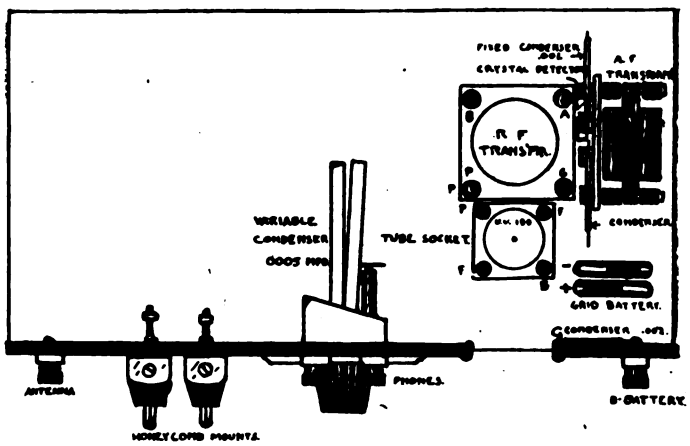

Fig. 2. Panel layout and arrangement of parts on base for efficient wiring. A hook type condenser is used for convenience and to save space.

good, but if the builder remembers that "a straight line is the shortest distance between two points," he will obtain better results.

Honeycomb coils are used in place of the conventional variocoupler. There is no deadend loss to these coils and they are simpler and easier to operate. One 35 turn, a 50 turn and a 75 turn coil are all that are required. Change these about until the best results are obtained.

The writer used a UV199 tube in this set and 112 volts on the plate, although better results could probably be obtained with a 201A or 301A tube with 150 volts on the plate. In most hook-ups given no

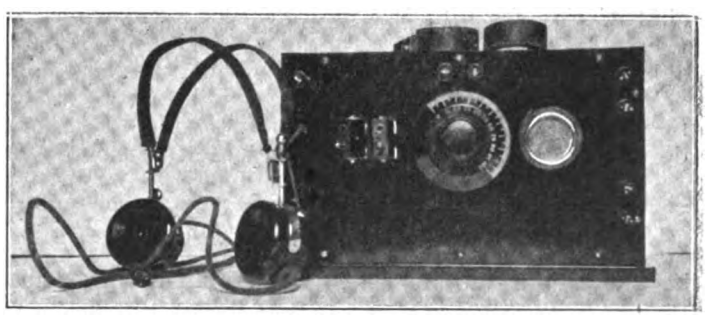

Fig. 3. Photograph of completed set, showing compact size and neat arrangement.

grid battery is designated. With the UV199, however, this is necessary for the best results.

No filament rheostat was used, as this simplifies the control, and as a rheostat is unnecessary with the hard tubes employed.

To tune, simply light the filament, tune the condenser and vary the distance between the two coils until the

(*Concluded on next page*)

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Increase Use of Radio for Fog Signals

By Carl H. Butman

WASHINGTON, D. C.—Radio, within the next few years, will play an increasingly important part in the work of protecting those who go down to the sea in ships from the mishaps which have made life on the ocean wave more of a peril than a pleasure, according to George R. Putnam, Commissioner of Lighthouses.

Commissioner Putnam, as a result of his experience with radio in the Lighthouse Service, is an enthusiastic supporter of this means of communication, and expressed his opinions strongly at the recent International Congress of Navigation in London. At that time he asserted the belief that radio for signals was destined to become one of the prime factors in life saving work, and, since his return to Washington, has plunged into plans for extending the use of radio in the Lighthouse Service.

Although not the first country to install radio fog signals—France having done so several years before we took the matter up—the United States today leads the world in the number and efficiency of such signals, and our methods are being studied abroad in those countries where the subject is under discussion. Our radio fog signals are all sent out on a 1,000-meter wave length. Those of France were sent out on a very low wave length and were lacking in efficiency, and the French Government now is remodeling all sets so as to use the internationally-adopted wave length of 1,000 meters.

Radio fog signals, as their name implies, are sent out in foggy weather to warn mariners that they are near to dangerous coasts. They have an all-weather range of some 30 miles, but this range can be extended, if greater distance is deemed desirable. The sets are automatic, needing only to be started, and are cared for by light-keepers and others, no special radio knowledge being required.

The apparatus now used is actuated by spark sets, but the service is soon to install the first of the tube sets which will eventually supersede all spark apparatus. The conversion from spark to tube is being made in order that a sharper signal be sent out, that interference between nearby fog signals may be eliminated and in order that the apparatus may be used for other purposes than fog signals.

A plan is now under consideration of using these fog signals at all times, regardless of weather conditions, that vessels may use them for location purposes. There has recently been established on the Pacific Coast a new southbound route for coastwise traffic which is many miles out of sight of land, and it has been suggested that the fog signals along the route be sounded constantly that they may be used by vessels equipped with direction finding apparatus, for determining location.

Another scheme under consideration by Commissioner Putnam is that of sending the fog signals upon request of any vessel desirous of determining its location, the request to be transmitted by radio to the nearest receiving station. At present, the radio for signals in the vicinity of New York send for two 30-minute periods each day, one in the morning, the other in the afternoon, and many vessels take advantage of the opportunity to test out their direction finders.

"Radio for signals gives promise, for the first time, of placing at the disposal of navigators beacons for use in fog comparable to lights in their dependability and the possibility of affording accurate bearings, superior to lights in their range and usefulness under all weather conditions," declares Commisisoner Putnam. And, with that idea always in view, the Lighthouse Service is devoting much time and thought to the greater use of radio, the only new aid to navigation developed for a number of years.

Short and Snappy

MANY are the amateurs who like to "CQ." Of course this is the easiest manner of attracting attention if you own a CW outfit; but the international regulation specifically states that a call is to be sent three times followed by "de" designating the abbreviation form and then sign your own call three times. If you do not get an answer within a reasonable length of time repeat the performance.

Why in the name of all that is fair and good under the sun will nine out of ten amateurs C Q a baker's dozen, sign a couple of dozen and then without even stopping repeat the performance over again? One amateur was heard on 200 flat with a note like a humming bird at close quarters (sweet was no name for it) actually "CQ" 18 times by actual count, sign six and then repeat the performance. Supposing some other fellow wanted to get "through" to him? Do you expect he is going to patiently wait until he gets all through with his "code practice" until he calls him? Decidedly not. He will take his receiver elsewhere and talk to a rational body who does not have the idea that everybody must like to listen to his "fist" and beautiful "note" on a 20 watt input. Go to it fellows, but for the Old Man's sake, be sane!

(*Concluded from preceding page*)

best results are obtained. When the set is first made, you will have to find the proper value for the grid battery. This will vary between 3 and 15 volts, according to the tube and the plate voltage used.

The action of the set is as follows: When it is tuned, the radio-frequency oscillations are impressed on the grid of the tube. As the secondary of the A. F. transformer is in the grid-filament circuit, it is shunted by a fixed condenser. The tube amplifies the oscillations and relays them to the circuit which consists of the plate, primary of the R. F. transformer, condenser which is shunted around the phones and B battery, and the filament. The induced oscillations in the secondary of the R. F. transformer are rectified by the crystal, and sent into the primary of the A. F. transformer. They are stepped up to a higher voltage here and sent through the circuit which consists of the secondary of the A. F. transformer, grid and filament, this time at an audio-frequency. The tube again amplifies and relays the signals to the plate circuit. They flow through the primary of the R. F. transformer, and as they are now of an audio-frequency, they will flow through the phones instead of through the condenser.

This explanation shows how one tube in this circuit is as good as three in a plain circuit. If care is used in the selection of good parts and these directions are closely followed, no trouble will be encountered.

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Increasing the Efficiency of the Receiving Set

By Byrt C. Caldwell

THIS article is written for the great majority of the radio public who own single circuit regenerative sets, or sets that regenerate by means of capacity feed-back, instead of by the more flexible inductive feed-back which is employed in the three circuit sets.

The amateurs (not the broadcast fans) long ago proved that the three circuit set was by far the better set of the two for both sensitivity, volume and selectivity. However, the idea is held by most broadcast fans, that the three circuit set is best only for its

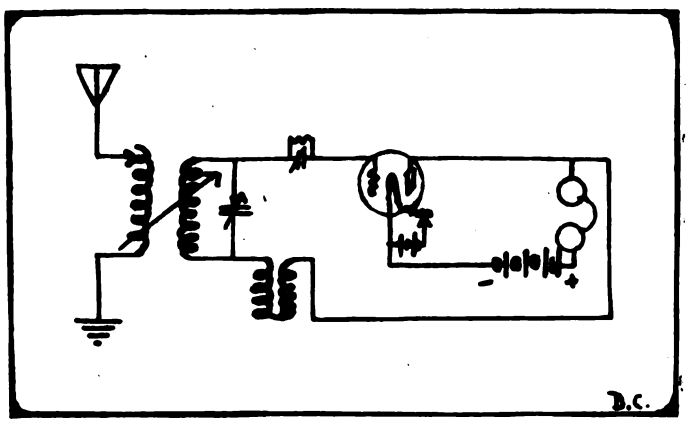

Fig. 1. Hook-up showing Caldwell's method of increasing the efficiency of the receiving set.

selectivity, and that the single circuit set excels when volume is desired. The amateurs are right. The reason that the fans have gained this impression is that they have seldom taken the time, and have seldom gained the necessary experience, to be able to tune the three circuit set for maximum results. I believe that any amateur will corroborate this statement.

The reason that maximum results cannot be obtained with these simplified circuits is that little control is had over the amount of regeneration obtained.

The writer has designed a set, or an improvement which can be added to any set, which increases the selectivity and greatly improves the results obtained, often doubling the volume of the signals. This addition puts the regeneration under control and in this way greatly improves results.

In constructing the set this improvement can be built right in. However, if the set is already made, it can easily be added. Briefly, the improvement consists of two honeycomb coils, connected in series in the plate-grid circuit. Room may easily be found for the coils over the variocoupler, or some place else on that side of the panel. Two 50 turn or two 75's will do, or if you happen to have a set of them, you can try different combinations until the best results are had. Connect them in series as shown. Be sure that the conections of one of the coils has not been reversed. Regeneration is controlled by varying the distance between them. If room can be found on the panel, a variometer may be used in place of the honeycomb coils. This would certainly be more convenient to operate. As to which would give the best results, I could not say, as I have not tried the variometer. I believe that the variometer would be more satisfactory.

The coils may be either back or front mounted. The diagram illustrates the arrangement of the instruments used in the hook-up shown.

The hook-up indicates how the coils are inserted in a circuit of this type. If your hook-up is of a different kind, you can easily place the coils in their proper positions by referring to the hook-up given. Place them in the plate-grid circuit.

Try this out. You will be surprised at the great

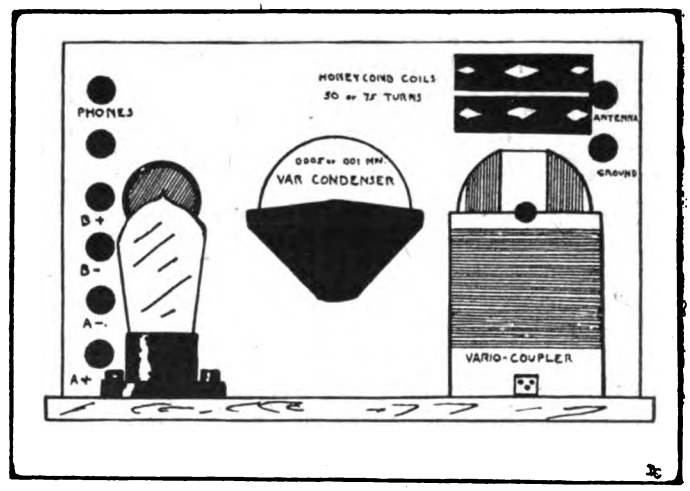

Fig. 2. Caldwell's suggested panel layout for increasing the efficiency of the receiving set.

improvement which results and the ease with which you can tune out some of the stations which formerly came in together.

Conserve the Current!

IF you were to measure the current that actually travels through the primary circuit of the radio receiver you would understand why it is that most receivers of the home-made type do not function well when it comes to distance. The actual current is so infinitely small that it is almost negligible, and when that same current has to actuate the delicate phones and other apparatus through a circuit that is full of high resistance joints (a soldered joint can be high resistance if it not done properly) you will probably understand why your set does not function as well as Jimmie Jones' even though you use better apparatus. He has his well soldered (not sloppily and without excess flux) and conserves the current. Think that over in your spare moments and then examine your set the next time you are hunting for that elusive distant station that just murmurs faintly in your phones, and which is plainly audible in Jim's.

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(C. Photonews)

The cast of the Radio Revue, a new departure in radio entertainment which has proved intensely popular. By broadcasting revues of this sort from WJY, stars like Kin Carroll, Art Conrad, Harry Hanbury, Frank Taylor, Raymond Ghee and many other scintillating Broadway favorites are able to reach many hundreds of thousnds of interested radio listeners.

(C. Kadel and Herbert)

Dolores Cassinelli, noted woman fencer and instructor, taking a few moments' rest after a strenuous fencing lesson. Miss Cassinelli is a great believer in strenuous sports and a constant supporter of radio. She has a complete receiver in her room at the Hotel Majestic, New York City, as is shown, and takes great delight in tuning in on those distant stations.

American and Canadian radio fans who have listened in to CKAC, the broadcasting station of La Presse, Montreal, have had a treat during the past few weeks, thanks to the co-operation of the White Star Line. Each Thursday night a special program was arranged by one of the White Star ships that was in port and the music was broadcast through this station. The illustration shows the quintette of the S. S. "Doric," the largest ship to enter Montreal harbor. Left to right, they are Harold Cowgill, Ernest Jowitt, Arthur Ransley, Sam Wooley, Edward Cappi. They have introduced several of the latest fox trots and waltzes through the medium of radio.

Radio Pictures Prov
Variety as Life

(C. Kadel and Herbert)

An interesting illustration showing how seriously some of the farmers' boys take to radio. Fred Alden, of Oakland, Maine, even takes his portable set out to the pasture while milking and uses the fence as an antenna. "Bossy" must be wondering where all the music is coming from.

(C. Kadel and
**Here is a hint
ent in the pa
ced by rockin
keep y**

Paul Whiteman's S.S. "Leviath an" Jaz
From New York

THE broadcasting by Station WJZ of Paul Whiteman's S. S. "Leviathan" Jazz Orchestra from the dock at the foot of West 46th Street, New York City, upon the return of Paul Whiteman himself from his successful trip to London, was an innovation never before attempted in broadcasting. The cheers of the crowds that recognized "Our Paul" and the strains of his famous "Leviathan" orchestra was something that, to say the least, was most novel.

The left hand illustration below shows the S. S. "Leviathan" orchestra on the dock before the microphone, preparing to broadcast one of their selections. The right hand illustration shows the "pick-up" and amplifying panels used to switch the microphone on and amplify the tiny impulses preparatory to sending them over l broadcast.

The recen most famed furore in br that every li chance to ar

On the ev able by mean dinner tende music. Well hundreds of

Of note to speech ampli the regular corporated in

(Both photos C. Kadel and Herbert)

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rovide as Much Life Itself

(C. Kadel and Herbert)

Here is a hint to mothers who have trouble in putting baby to sleep when out in the park. Take your De Forest set along and you won't be bothered by rocking him to sleep, and at the same time it will amuse you and keep you from feeding too many peanuts to the squirrels.

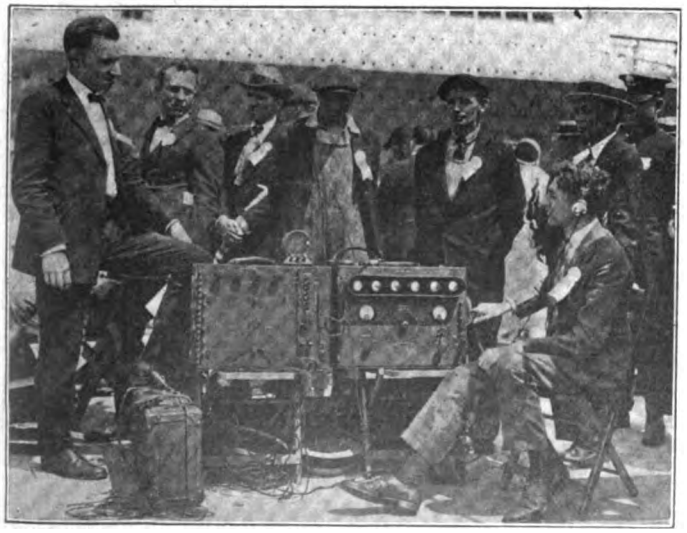
an" Jazz Orchestra Broadcasts York Pier

them over land lines to be further amplified and then broadcast.

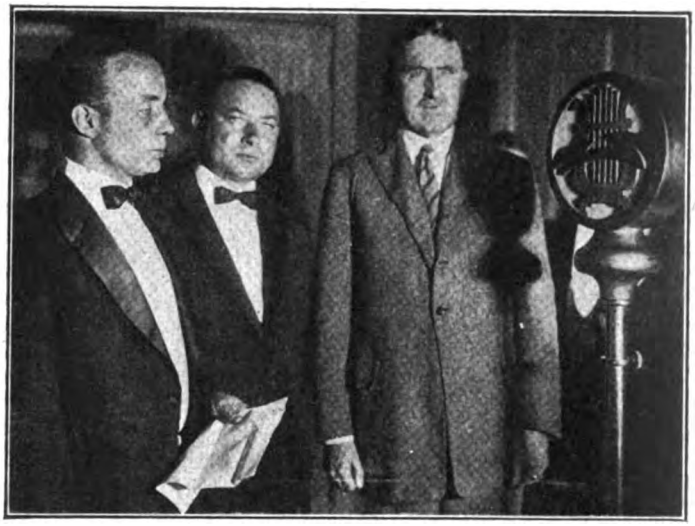
The recent arrival of the famous leader of America's most famed institution of musicians created quite a furore in broadcasting circles, and there is no doubt that every listener wishes that Paul Whiteman had a chance to arrive about three times a week.

On the evening following his arrival, the fans were able by means of radio to be present at a complimentary dinner tendered to him and to hear the specches and music. Well, there is little happens these days that the hundreds of thousands of listeners miss.

Of note to radio fans will be the fact that the power speech amplifier is using six UV201A tubes instead of the regular five watt tubes that are most usually incorporated in the apparatus.

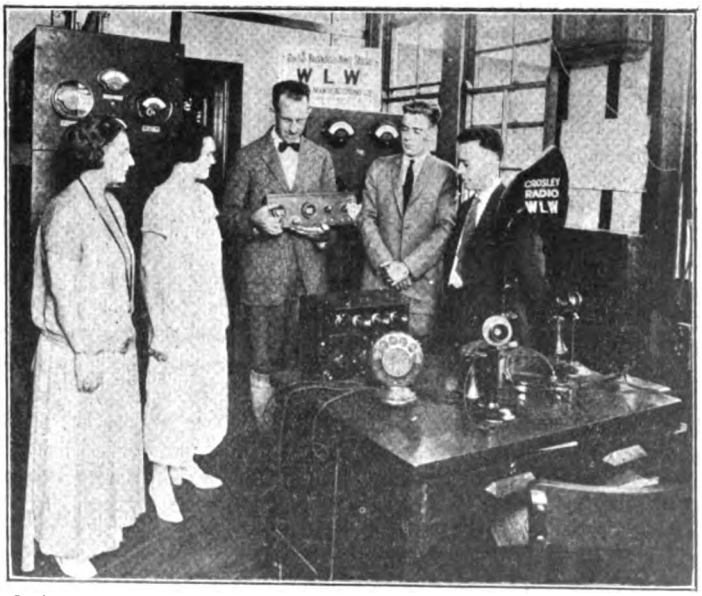


Leon Abrams, president of the Radio Chain Stores Co., of Trenton, N. J., being entertained while watching the bathers in the Delaware River by means of his portable loop receiver. This is a tip for the canoists. Take your portable set along with you instead of your "uke" and you can have variety—everything from a lecture on the evils of the drug habit to a cornet solo played by a member of the Police Band. This is the spice of life, these days.



(C. Underwood and Underwood)

Theodore Roosevelt, Jr., Assistant Secretary of the Navy; Major General Frank L. Hines, Deputy Chief of Staff, U. S. Army, and David Sarnoff, Vice-President and General Manager of the Radio Corporation of America, officiating at the opening of the new station WRC, Washington, D. C. Theodore Roosevelt, Jr., delivering the commemoration speech before the microphone of the new station.



Radio wedding candidates inspect broadcasting station WLW from which the ceremony will be broadcast. Mr. Powell Crosley, Jr., Chairman of the Radio Committee of the Cincinnati Fall Festival, explaining the working of one of the presents that are to be given to the principals in the forthcoming weddings. The ceremonies will be broadcast on September 4 from the Music Hall, Cincinnati.

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Report on Fading

HARTFORD, Conn.—Fading shows no partiality to radio fans since all listeners have noticed that it interferes appreciably with the reception of broadcast programs. Fading is the variation in reception intensity caused by atmospheric conditions beyond control of the listener and cannot be associated in any way with the type and construction of receiving apparatus in use at the time.

A program may be coming in with such strength that it can be heard throughout an ordinary room when suddenly the volume of sound will diminish until it is scarcely audible with the receivers held close to the listener's ears. Observations of this condition have been completed by the U. S. Bureau of Standards in conjunction with the American Radio Relay League. A brief summary from the report to appear in the September issue of "QST" follows:

"Observations to date indicate that the fading is greatest for waves within a certain range of wave lengths, and is less for either longer or shorter waves. Fading is more pronounced at wave lengths in the neighborhood of 250 meters than at longer wave lengths. Transmission experiments using 100 meter waves indicate less severe fading than on 250 meters.

"It is easier for a large mass of something to somewhat obstruct a 200-meter wave than a 2,000-meter wave.

"A preliminary statistical study of the transmission range of certain broadcasting stations, which has been made since the work described here was done, indicates that at a distance of the order of 150 miles from the transmitting station a noticeable decrease is observed in the signal intensity, which increases again for greater distances.

"The distance at which this occurs varies with the wave length, which suggests that its explanation is associated with the variation of ground absorption with wave length."

New Stations Licensed

FOUR new radio broadcasting stations were given licenses and six stations were transferred from Class C to Class A during the week of August 13, the Radio Division of the Department of Commerce reports. Of the new stations, only one was in the eastern section of the country.

New Stations

Call	Station	Class	Frequency Kcys	Wave Length Meters	Power Watts
WTAH	Ferro, Carmen, Belvidere, Ill.....	A	1270	236	10
KFJM	University of North Dakota, Grand Forks, N. D.....	A	1310	229	100
KFJQ	Valley Radio Div. of Electric Construction Co., Grand Forks, N. D. (portable station).....	A	1190	252	5
KGB	Tacoma Daily Ledger, Tacoma, Wash.	A	1190	252	50

Transfer Class C to Class A

Call	Station	Class	Frequency Kcys	Wave Length Meters	Power Watts
WDAH	Trinity Methodist Church, El Paso, Texas	A	1120	268	100
KDZB	Siefert, Frank E., Bakersfield, Calif..	A	1250	240	100
WNAL	Rockwell, R. J., Omaha , Neb.....	A	1240	242	20
WIAI	Heers Stores Co., Springfield, Mo....	A	1190	252	20
KXD	Herald Publishing Co., Modesto, Calif.	A	1190	252	10
WCAS	Dunwoody Industrial Institute, Minneapolis, Minn.....	A	1220	246	100

"Use Radio Sets in Balloon Races"—Olmstead

REPORTING officially to the Chief of the Army Air Service on the use of radio in balloon races, Lieut. R. S. Olmstead, winner of the recent race says in part:

The S-6 balloon radio installation complete with antenna and counterpoise weighed around thirty pounds, representing roughly one bag of sand ballast. Both Lieut. Shoptaw and myself agreed that it was worth several times its weight in sand. It should always be remembered, furthermore, that the set could be used as ballast quite efficiently by the simple process of dissembly.

Immediately upon taking off we dropped our antenna and (copper screen) ground and wired up to receive. The results were uniformly good from the first. Musical program after musical program with great clearness came in, and incidentally the Dempsey-Gibbons fight returns came from Detroit by rounds. There seemed always to be music in the air, and to anyone who has experienced the monotony, when everything is going well, of the hours of darkness in a balloon race flight, the value of such restful relief therefrom is very evident. There should always be two head-sets provided to a basket; we had but one. They do not interfere in the least with the work of the pilots, and the tendency is to wear them at all times.

From Detroit, Chicago and Schenectady, particularly from Schenectady, we received quite definitely the weather reports consisting of general flying conditions, wind directions and velocities, cloud conditions, and of great importance, the presures recorded at various important cities. This information was quite conclusive in influencing our tactics to obtain a suitable direction of flight in order to obtain maximum endurance and distance. A feature which should be added and which we keenly felt the need of for several hours while out of sight of any land marks over Lake Erie is a direction finding attachment. A loop hung above the load ring with compass attached thereto, it is believed, would solve this problem.

A point of vital importance in a race was the advice received by radio of the location of our various competitors from time to time. At the time of landing we knew that all but three of our competitors had been accounted for, and we were quite certain that we were in one of the three winning positions and eligible to go to Belgium. Had we not had this information, we might have tried to cross Lake Ontario without sufficient ballast, and failing in the attempt, would have disqualified ourselves.

My recommendations are that a radio set should be installed in every racing balloon, directional attachment should be added and two head-sets should always be provided.

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Latest Radio Patents

Carrier Radiotelephone System

No. 1,458,949: Patented June 19, 1923. Patentee: H. W. Nichols, Maplewood, N. J.

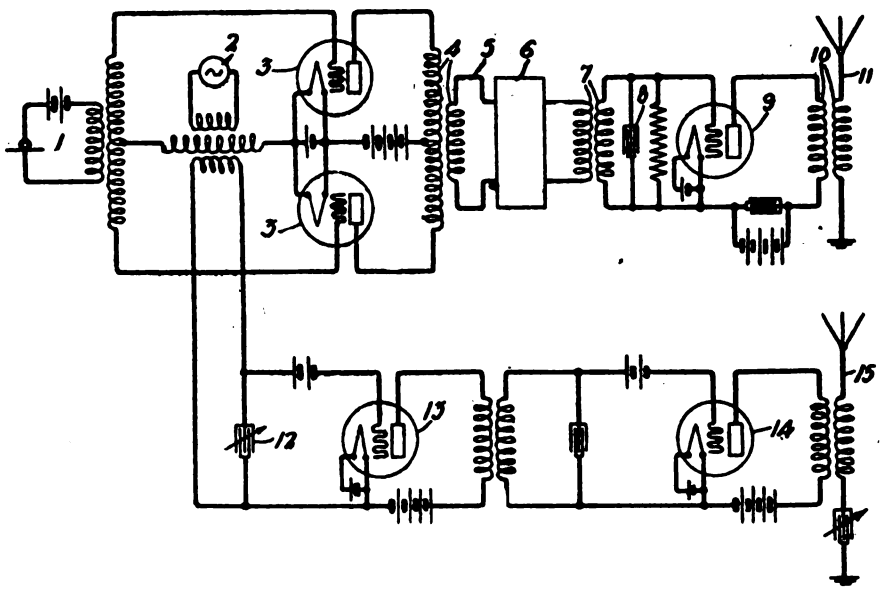
This invention relates to a method of and means for transmitting signals, and more particularly to carrier telephone systems.

It has been proposed in signal transmission by modulated carrier waves to prevent the transmission of the unmodulated carrier wave component, while providing for the efficient transmission of the modulated carrier wave component, as described in the Journal of the A. I. E. E. Vol. XL. No. 4, page 314, April, 1921. It has also been proposed in a carrier system, to transmit a signal modulated wave i. e. the modulated carrier and two side band components and an unmodulated wave of frequency different from that of the carrier wave. At the receiving station the signal modulated and unmodulated waves are combined to produce a signal modulated wave of intermediate frequency which is then selected and again detected to give the signaling current.

The present invention has certain advantages over each of these systems in that it does not require a synchronously operating source of local oscillations at the receiving station, as in the first system, or the additional detector, etc., as in the second system, to effect detection or demodulation of the incoming signal waves, whereby speech currents may be supplied to the receiver.

The present invention is directed to a system in which all the advantages inherent in the two systems briefly described above may be utilized and consequently a much greater economy of power and apparatus may be secured. According to this invention a carrier wave is modulated in accordance with speech frequency currents, the unmodulated carrier component and one side band are suppressed, the remaining side band of the pure modulated wave and a selected amount of unmodulated energy from the carrier source are transmitted independently and more efficiently to a distant cooperating receiving station where they are combined.

The primary object of this invention is to provide a carrier system which is both efficient and economical. Another object is to provide means whereby a pure modulated wave and energy of the fundamental carrier frequency may be transmitted from a signal station.



Method of producing a pure modulated wave whereby the unmodulated carrier component and side band are surpressed.

Electron Emitting Cathode

No. 1,459,466: Patented June 19, 1923. Patentee: C D. Hocker, East Orange, N. J.

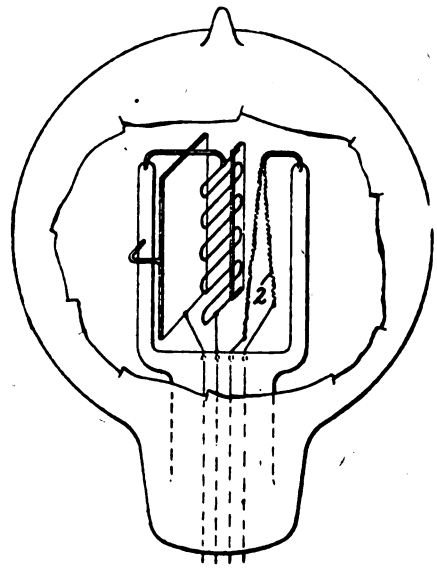
This invention relates to electron emitting cathodes, and the process of making the same, and has for an object to improve the characteristics of such cathodes in any one or more of the following particulars:

A.—To make the thermionically active coating adhere more firmly to the electrode or filament by mechanically binding the active coating materials to the filament.

B.—To increase the electron emission at any given temperature.

C.—To lengthen the life of the filament at any given temperature.

This is accomplished by adding another substance such as a noble metal to the coating before it is applied. By noble metal is included compounds of a noble metal from which the noble metal may be produced by heating a compound thereof; for instance, gold, silver and platinum may be produced by heating gold oxide, silver oxide and ammonium chloro-platinate, respectively. Among the noble metals may be mentioned silver, gold and platinum, and the presence of one of these metals in the filament coating has been found to give the desired result. Whether the noble metal will serve to mechanically bind the coating to the filament, whether it increases the electron emission or length of life, of any combination of these, depends upon the noble metal used as well as upon the particular thermionically active substance or substances of which the coat is composed. The particular substance used in the coat, and the properties of the filament that are thereby improved will be later described.



Details of a vacuum tube of the triode type which allows treatment whereby added electrance emission is possible.

The use of a material in the coating which serves to mechanically bind the coat to the filament has two distinct advantages: First, it makes it possible to apply any coating in an adherent form; second, it permits the application of coats composed of a mixture of substances of definite proportions—a definiteness which cannot be insured when these substances have to be alternately applied in layers as previous filaments have been made.

* * *

Electric Condenser

No. Reissue 15642: Patented July 3, 1923. Patentees: C. F. Smith and W. H. Smith, Brooklyn, N. Y.

Our invention relates to electric condensers and has for its object to provide an improved simple and efficient condenser of this character, and also an improved method for the easy and expeditious making of such condensers. Condensers of our improved type are intended primarily for use in wireless telegraphy or telephony but they are also adapted for other uses.

A satisfactory embodiment of a condenser made according to our invention is shown in the accompanying drawing. The condenser there illustrated comprises units any number of which may be assembled readily to form a condenser of the desired capacity. Each of the units shown comprises a base or body portion which gives the unit the requisite strength or stiffness; a flexible dielectric, preferably paper impregnated with insulating material, such as wax; and sheets of metal foil preferably non-resilient metal, such as lead or "tin foil," though other metal foils may be used; such dielectric and metal foils being folded or wrapped together.

* * *

Industrial Notes

Electric Equipment Service Co., Pittsburgh, Pa., plans to erect a new factory building on Liberty Avenue.

* * *

The Maring Wire Co., Muskegon, Mich., manufacturer of magnet wire, has taken possession of its new factory building at Western Avenue and Barclay street.

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Answers to Readers of Radio World

I have constructed the circuit shown on page 8 of RADIO WORLD, *April 7, and find that while local stations come in strong, I cannot get any distance. Could I apply the super-regenerative principle to this receiver in order to get distance?—James E. Stevens, 1734 K Street, N. W., Washington, D. C.*

You should not expect to do any distance work in the summer months. The fact that you receive local stations strong proves that the circuit will bring in distance in the cooler months. Even the circuits employing three and more tubes are hampered as to distance in the summer. Be satisfied that you have a very good circuit and do not bother with super circuits. They create lots of interference due to re-radiation of oscillations and are hard to tune. Excellent work has been done with the three circuit set you mention—in the cooler months. During the summer you should be satisfied to receive strictly local work, with probably a medium distance station on a cool evening or very early in the morning.

* * *

I have constructed the three-circuit type set using two variometers (moulded) and variocoupler. It works fine except for a high pitched whistle which I have brought to a medium by adjusting the grid leak, but still it is loud enough to be extremely bothersome when trying to listen to any programs. I can stop it temporarily by touching the shafting of the grid variometer and the ground post. How can I stop the whistle without dong this? Reducing the filament current does not help any as it squeals whether the filament is low or high.—Henry Ensminger, Pulaski, Ia.

Your trouble is probably due to the fact that your variometers and coupler are crowded together too closely, and therefore you are getting coupling from your grid and plate circuits. Space them and ground one side of the filament circuit, being careful that you do not short any part of your circuit. This should stop the squeal.

* * *

My neighbor and myself both have single circuit receivers, both designed and built the same, using the circuit described as the Colpitts oscillator. Neither of us can get any satisfactory results when we are both on as when one is tuned in it produces howls and screeches in the other. How can this howl be stopped?—J. L. Barney, Kelly Street, Bronx, N. Y.

There is no method of curing the howls caused by re-radiation on nearby single circuit sets. As long as both sets are in operation at the same time and listening to the same station, or on the same wave length, you will both be bothered with this howl. The particular type of set you mention is a very violent producer of oscillations and in receiving it really acts as a miniature transmitter, creating a carrier wave of its own, which is what you both notice so much.

* * *

I have four variometers, one 23 plate condenser and one 43 plate condenser, honeycomb coils 35, 50 and 75. Should I have a variocoupler? If so what make should I use? Is it possible to use R. F. ahead of the first tube in the Flewelling? Is this circuit superior to the super that uses D. L. 1250 and 1500 honeycomb coils? Is the Turnbull circuit with one stage of amplification superior to Flewelling and one stage of audio-frequency?—C. W. Fisher, P. O. Box 476, Souris, Manitoba, Canada.

You do not state in what circuit you want to use all the apparatus. There are several good makes of coupler on the market. If they bear a standard and well known trademark they are safe. It is not possible to incorporate radio-frequency with the receiver you mention, as the oscillations generated by the "super" action would render the circuit impossible to manipulate. Sufficiently loud signals should be obtained with this circuit to satisfy, but it is not as loud as those received on an Armstrong super-regenerator when properly operated and constructed. Turnbull has written several articles. You do not mention which one you refer to, so we cannot compare them.

* * *

Will you kindly check the enclosed hookup and let me know if it is the same as that used by Dick Roberts? If not, kindly correct it.—Alfred L. Megill, 761 Atlantic Ave., Brooklyn, N. Y.

Your circuit is identical with the one used by Dick Roberts. The circuit as supplied by the writer mentioned appeared in RADIO WORLD, August 18.

* * *

Can I use the variocoupler described by Arthur S. Gordon in RADIO WORLD, *March 3, in the improved Turnbull receiver, described in* RADIO WORLD, *July 14? Can this set be used with outside antenna without changes?—W. H. Morelourn, Thomaston, Conn.*

This set is designed for use with a loop, and if you desire the same circuit designed for antenna and ground, see article by the same author in RADIO WORLD, May 19. You can use the coupler mentioned in these circuits if it is carefully constructed.

* * *

Kindly advise me of a good circuit to use for the reception of distant signals. I am fairly well versed in radio, but as yet have only constructed the Rheinartz. Can you furnish panel layouts? Do you advise the Zenith circuit?—Henry Bergstedt, 6607 S. State Street, Chicago, Ill.

It is a very difficult matter to prescribe any particular circuit for the purpose you mention. Unless you wish to use more than two tubes, the Rheinartz is about as good as any. We do not furnish panel layouts. We cannot at the present time publish the circuit you mention.

* * *

In the article by D. S. Brown what is meant by "basket weave coupler?" He recommends exactly 63 1-3 turns on the rotor. Is it absolutely necessary to have that many? --Karl Dunlap, Kinmundy, Ill.

The basket weave coupler is made with small round uprights placed in the form of a circle instead of a tube. The wire is woven in and out of these. This lessens the distributed capacity. The mention of 63 1-3 turns was made as a little joke instead of a correct technical description. Wind it full of wire—whether there are 62 or 65 or 70 turns will not matter very much.

* * *

I have a two stage amplifier which worked fine last winter on 90 volts, but when the B batteries fell to 60 it would not work on the second step. After rewiring the amplifier, it does not work on 90 volts, but will on 45, and the second step is no louder than the first. My tubes are UV201 and have seen six months of good service and both work well as detectors with but 24 volts on the plate. How can I remedy my trouble? —Gene Ullemeyer, 1511 9th Ave., Rock Island, Ill.

Make sure that one side of your secondary amplifier transformer lead goes to the negative side of the A battery. Test out your transformer. There is a possibility that it is burnt out and you are getting return through some induction in the lines. This has been found to happen very often after months of operation, when the second stage suddenly lays down. Make sure of your connections before you get discouraged. Examine the nips of your tubes to see that they are all making perfect connection with the lugs on the socket. The little solder tip sometimes falls off, or wears off, and does not make good connection. See that it is not corroded and therefore making bad contact. Polish them by means of a very light rubbing with emery cloth.

* * *

In RADIO WORLD, *August 4, you published an article by A. D. Turnbull. Is this circuit adaptable to a six volt tube operated by a storage battery? If so, what are the constants of the circuit with especial reference as to whether or not the tube is a detector or amplifier, the voltage of the B battery, size of grid leak? Is a vernier rheostat essential? How is panel shielding most effectively and cheaply accomplished?—Harold W. Crockett, 2624 Channing Way, Berkeley, California.*

This circuit is adaptable to a 6 volt tube simply by using a suitable socket instead of the dry cell socket. The constants remain the same in all cases, with the possible exception of the grid leak, which should be variable in order to determine what is the best value for the particular tube you are using. A vernier rheostat is not absolutely essential, but it is extremely helpful. Shielding a panel is best accomplished after the panel is completely drilled. Lightly sandpaper the rear surface, rotating the paper in circles instead of straight. Give it a good coat of thin orange shellac, and let it dry partially until it is very sticky. Then cover the back of the panel with tin foil, pressing it on firmly and smoothly by means of a roller. Allow to dry 24 hours in a cool place, and then with a sharp knife cut away circles in the spots where your holes are drilled. When the set is constructed, ground the shielding to the ground post of the set.

* * *

I am learning the code by using a Ford spark coil connected across the antenna and ground by means of a spark gap. A 6 volt storage battery is used to supply current for the operation. I wish to know if this is transmitting. Could I cause any disturbance to local stations by so doing? I do not have a license. Where can I get information on the necessary knowledge to enable me to obtain a license?—Kent Deckard, P. O. Box 3, Rusk, Texas.

You are transmitting. Furthermore, you are using an untuned transmitter which is capable of radiating a very broad wave and creating a great deal of disturbance. The best manner of learning the code is by means of a key, dry cell and buzzer. It does not have to be connected to the antenna. If you continue you will get in trouble with the government, so stop it until you can obtain a license.

In order to get an amateur license you must be able to send and receive at least 10 words per minute (five characters constitute a word, so 50 characters per minute is necessary). You must have a knowledge of the international radio laws pertaining to the secrecy of messages, the operation of a station during distress calls, the international abbreviations. You must also be able to draw diagrams of your receiver and proposed transmitter, and have a knowledge of the working of both. You must know your transmitting input and output and be able to answer questions on simple electricity. For further information write to the Department of Commerce, Radio Division, Washington, D. C. The radio inspector in your district is located at New Orleans, La. Apply to him for information and stop transmitting until you obtain a license.

* * *

Can I add a one or two stage amplifier to the dry cell circuit of A. D. Turnbull, published in RADIO WORLD, *August 4?—Henry Conn, Boonton, N. J.*

You can do this. A suitable circuit for your purpose appeared in RADIO WORLD, August 18, page 20.

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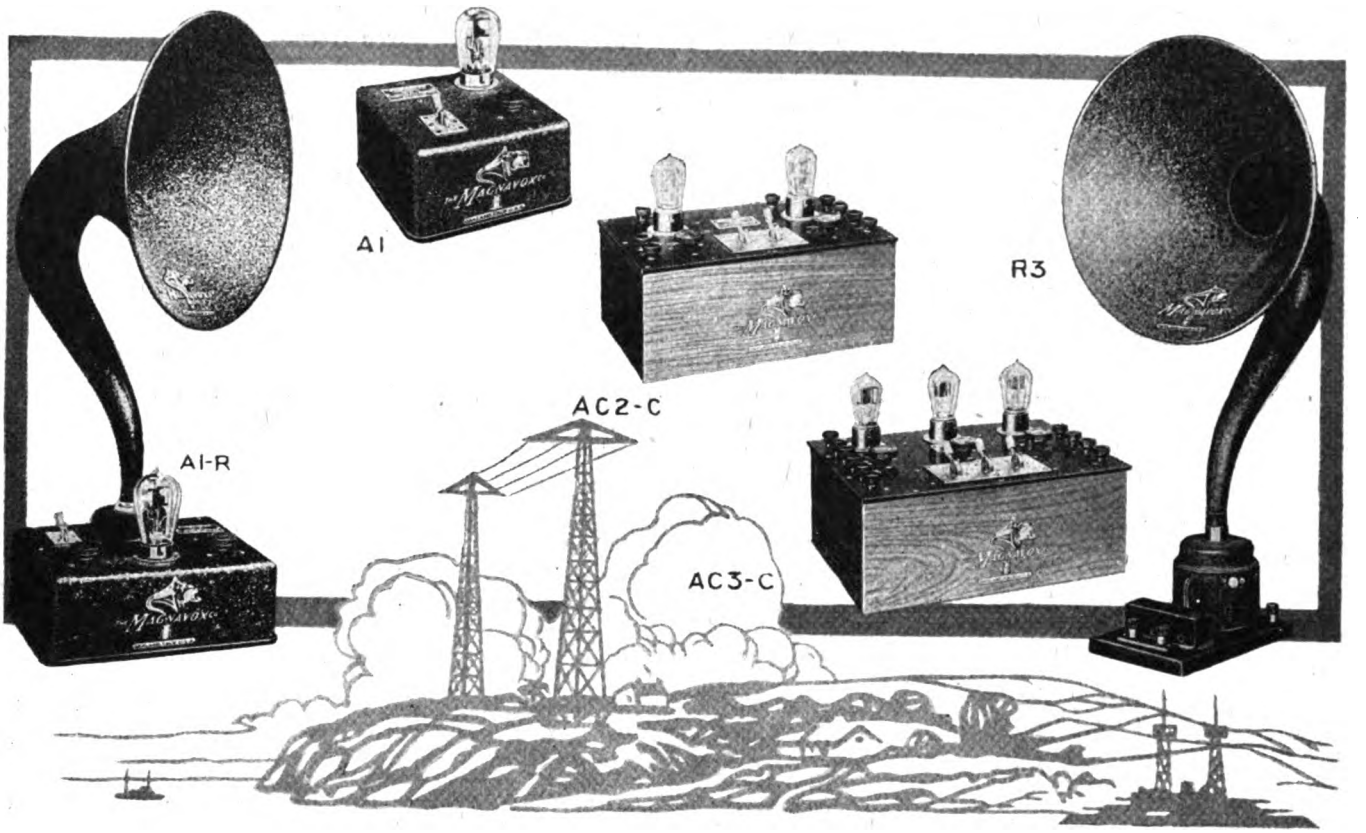

Radio takes another step forward with these wonderful new Magnavox devices

THE new Magnavox models here shown extend and supplement the already famous Magnavox line of Reproducers and Power Amplifiers. There is a Magnavox for every receiving set.

New Magnavox Combination Set

A2-R Insures convenient and perfect Radio reproduction. Consists of Magnavox Reproducer with 14-inch horn and 2-stage Magnavox Power Amplifier, as illustrated $85.00

Magnavox Reproducers

R2 with 18-inch curvex horn in new acoustic finish . $60.00

R3 with 14-inch curvex horn in new acoustic finish . 35.00

M1 *new Magnavox Reproducer* requires no battery for the field, thus meeting requirements of dry battery receiving sets. With 14-inch curvex horn in new acoustic finish . . . 35.00

Magnavox Combination Sets

A1-R consisting of Magnavox R3 Reproducer with 14-in. horn and 1-stage Magnavox Power Amplifier . 59.00

A2-R consisting of Magnavox R3 Reproducer with 14-in. horn and 2-stage Magnavox Power Amplifier . 85.00

A1-M same as A1-R but with the new Magnavox Reproducer M1 . . . 59.00

A2-M same as A2-R but with the new Magnavox Reproducer M1 . . . $85.00

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A1 meets the demand for a 1-stage Power Amplifier. Special finish metal case. 27.50

AC-2-C Magnavox 2-stage Power Amplifier with Bakelite panel in highly finished hardwood case . 55.00

AC-3-C Magnavox 3-stage Power Amplifier . . 75.00

Ask your dealer for a demonstration. Interesting booklet will be sent on request.

The Magnavox Company
OAKLAND, CALIFORNIA
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World pioneers in the development and manufacture of sound amplifying apparatus

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Magnavox Reproducers and Amplifiers

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Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. *Telephone Bryant 4796*

The Second Annual National Radio Week

Almost a year has passed since the inauguration last fall of RADIO WORLD'S suggestion of National Radio Week.

The intention of everybody this year is to make the Second Annual Radio Week more important in every way than the initial event.

This is not a one paper or a one man idea. It is altogether too big and too good for that. Everybody last year joined hands with everybody else, and the result was worth while.

Let's join together once more and do our utmost to make the Second Annual Radio Week bigger and better than ever.

Have you any ideas? Send them in.—Editor, RADIO WORLD.

Mayor Moore Strong for Municipal Radio

EDITOR, RADIO WORLD: A municipally owned and operated radio broadcasting station would appear to be a future requirement of every large city. It presents unlimited capacity for the apprehension of criminals, to warn the citizens in the event of conflagrations, disasters, and to inform residents of the latest schemes of sneak thieves, confidence men, and others who prey upon the public.

The radio of the future will unquestionally enter into official municipal activity, and will, no doubt, in a relatively short time take its place among all progressive discoveries and inventions in its service to the citizens.

Very truly yours,
J. HAMPTON MOORE,
Philadelphia. Mayor.

Information for RCA Dealers

PIERRE BOUCHERON, advertising and publicity manager of the Radio Corporation of America, is making a thorough tour of the Mid-West where he is visiting the leading RCA jobbers and dealers in an endeavor to secure a cross-section of opinions and views on the radio trade tendency in that territory. Mr. Boucheron is particularly interested, while on this trip, in conducting research in the Mid-West territory for the guidance of the Radio Corporation in its future relations with the trade.

The results of these observations he will incorporate in a free course to radio dealers, to be known as "How to Sell Radiolas." The object of the course will be to bring to their attention the three fundamental ideas behind successful retailing activities and to suggest applications of these fundamentals that will be useful to the dealer and jobber in selling Radiolas. These ideas will include advertising, demonstrating and service.

It is believed the radio trade will find this information highly valuable in the conduct of their work when the data is made available in handbook form.

The Way Sol Kahan Does It

Other Newsdealers Can Do the Same Thing

Sol Kahan keeps a prosperous news, stationery and cigar store at 305 North Avenue, New Rochelle, N. Y. He sells a great many RADIO WORLDS in the course of a month. We noticed recently that Mr. Kahan had two unsold copies of RADIO WORLD of August 11 on his stand. A few days later he was asked if these copies had been returned to the American News Company, and he replied, "No. I keep my back numbers of RADIO WORLD in stock and sell them out, sometimes quite a while after their dates. I find there is a good demand for back numbers. In this way I always sell out my full supply of RADIO WORLD."

Here is a tip worth following by other newsdealers.

Radio Trade Notes

The Offenbach Electric Co., 1452 Market Street, San Francisco, Cal., is interested in push and pull transformers.

* * *

Clayton Lord, Box 152, Wrightsville, Ga., is starting a retail radio business.

* * *

Globe Radio Supply Co., P. O. Box 23, Dorchester, Mass., is in the market for radio parts.

* * *

Lake County Overland Co., Leesburg, Florida, is installing a radio department.

* * *

George C. Blackwood, 243 East Upsol St., Mt. Airy, Philadelphia, Pa., is in the market for hinged lid cabinets.

* * *

Samuel W. Chapman, proprietor of The Electric Shop, Cortland, N. Y., has filed a petition, with liabilities of nearly $10,000 and assets of $3,950, with creditors principally in New York City.

Classical Jazz Via Radio

A NEW development in music that has been stirring up a great deal of talk lately, not only in musical circles, but with the general public, has taken place. The persons responsible for this latest innovation are Francis Loubet, musical director and bandmaster, and his manager, Max Brav, both very well known to the music world. According to a recent canvass of the radio broadcasting stations, the most popular music proved to be grand opera and typical American "jazz," and these gentlemen have hit upon the novel idea of combining both. In other words, we will now be able to listen to a potpourri from "Aida" or "Carmen," or one of Tschaikowsky's famous compositions arranged in "jazz" form, without in any manner detracting from the value of these masterpieces. This new idea is expected to prove a fitting form of musical entertainment for the most critical student as well as the modern dance enthusiast.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Carey's Repair Shop, R. R. No. 3, Galveston, Indiana. (Dealer.)
H. H. Gardner, 63 Clark St., Malden, Mass.
Alva D. Kerr, Oakland, Maine.
Richard Bladel, 1522 Ninth Ave., Rock Island, Ill.
Leland Schermerhorn, Radio Operator, S. S. "Wm. T. Roberts," Marine P. O., Detroit, Mich. (Assembles receiving sets.)
Fred A. Mulligan, Rosser, Manitoba, Canada.
Frank Gabriel, 181 Elizabeth St., West New Brighton, Staten Island, N. Y. (Repairs and installs radio sets.)
Lewis Radio Shop, 43 Columbia Ave., Passaic, N. J.
Edwin A. Jenkins, radiotrician, Box 10, Station S, Brooklyn, N. Y.
Clifford McFaul, Lachute Mills, Quebec, Canada. (Retailer.)
Robert Wakefield, 2063 East 82nd St., Cleveland, Ohio.
Walter A. Ladwig, Seneca, Kansas. (Dealer.)
Offenbach Electric Co., 1452 Market St., San Francisco, Cal. (Retailers.)
J. P. Enead, 629 South Eighth St., Paducah, Ky. (Retailer. Interested in battery chargers.)
Howard P. Sharts, 95 Kingston Ave., Brooklyn, N. Y.
Willard Watts, 1831 Idlewood Ave., East Cleveland, Ohio.
J. R. Griffis, Route 6, Box 65, Jacksonville, Florida. (Is building several sets for sale.)
Stockton Electric Shop, G. A. Fleck, Stockton, Kansas.
Louis Brettschneider, 488 Bradford St., Brooklyn, N. Y.
Clayton Lord, Box 152, Wrightsville, Ga. (Retailer.)
Globe Radio Supply Co., P. O. Box 23, Dorchester, Mass.
Rodolfo Rodiguez, 309 South Albany Ave., Tampa, Florida.
A. E. Lyerly, 207½ Main Street, Fort Worth, Texas.
Alfred B. Anderson, Proctor, Vermont.
H. P. Osterhout, General Delivery, Utica, N. Y. (Interested in A. F. and R. F. transformers.)
Square Deal Radio & Electric Co., Box 558, Fenton, Mich.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

AMERICAN RADIO RELAY LEAGUE, second national convention, Chicago, Ill., September 12-15, 1923. Chicago Radio Traffic Association, 959 The Rookery, Chicago, Ill.

Fake Phone Maker Enjoined

C. BRANDES, Inc., 237 Lafayette St., New York City, has secured from Vice Chancellor John Bently, of Jersey City, N. J., an injunction restraining the Holley Manufacturing Company, of Jersey City, from making radio headsets purporting to be the "Superior" brand which is a trademark of C. Brandes, Inc.

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Radio Press Dinner and Get-together Jollification at the Hotel Pennsylvania

REPRESENTATIVES of radio and various other papers gathered at the Hotel Pennsylvania, New York City, on Wednesday evening, August 22, for the purpose of welcoming Benjamin J. Cohon into the radio fold. This event was planned by Philip Wolf and Harry Saunders, of Philip Wolf, Inc., advertising agents for Rova, and who brought together these representatives on the occasion of Mr. Cohon's joining the Rova concern. Mr. Cohon, who lives in Westwood, N. J., is a noted organizer, having for several years aided in the building up of the successful and far-reaching policy of the United Cigar Stores under the able leadership of Edward Wise. Mr. Cohon, who is now vice-president of the Rova Products Corporation, becomes so for the purpose of stabilizing radio merchandising activities in the metropolitan area.

Besides an excellent dinner, served more or less in accordance with the novel menu card reprinted herewith, there were several impromptu talks, including an interesting one by Mr. Cohon.

Frank Tinney, the noted comedian, was among those present. During his remarks Tinney said that one night after his wife had gone to bed he tried for DX, but that all he got was "Hell." Mrs. Tinney, who also was among those present, assisted in entertaining the guests in her clever way.

Mr. Tinney's remarks, as well as the addresses by the others who spoke, were broadcast by WJZ.

Those in attendance were: Mail, Stuart Rogers, F. F. Humphreys; Sun-Globe, E. L. Bragdon, F. C. Ehlert; Tribune, Jack Binns; Times, O. E. Dunlap, Jr.; Brooklyn Eagle, E. M. Applegit; Radio Dealer, L. A. Nixon, N. B. Zimmerman; Radio News, S. Gernsback, R. W. Demott; RADIO WORLD, F. S. Clark; Wireless Age, H. L. Welker; Radio Retailer, A. H. MacAttamanay; Radio Broadcast, A. H. Lynch; Radio Record, A. Borras; Phonograph Weekly, Sidney Davis, M. Kennedy; C. B. Popence, Broadcasting Director R. C. A.; Frank Tinney, the comedian; Frank H. Shevit, N. Y. American Tax Expert; B. J. Cohon, Vice-President Rova; Mrs. Frank Tinney; Mrs. Goldman, Rova; Philip Wolf, Harry Saunders, Philip Wolf, Inc., Adv. Agents for Rova; Henry Anchester, President Greeley-Madison; Sonny Brakas, Leo Fried, Rova; Ralph Rubenstein, Rova.

Testimonial to
Mr. B. J. Cohon and Radio Press
by
R-O-V-A Radio Products Corporation

MENU

Sea Food Cocktail la Grebe
Gumbo en Reflex
Super Celery Olives Magna-Vox
Regeneration La Volstead
Broiled Bluefish a la Armstrong
Tuned Potatoes Variable
Aerial Sweetbreads. Marconi
Green Corn Grounded
De Forest Duckling. Apple Sauce Rova
Salad Cockaday
Vichy 45 Volt Gingerale 2,000 Ohms
Non-Static Ice Cream
RCA Cake
Café

Radio Cigars
Audio Cigarettes

Hotel Pennsylvania
August 22, 1923

Technically Out of Bounds

Madge—You should have your hair bobbed again.

Marjorie—I guess you're right, dear. My wave lengths are getting too long.—*New York Sun.*

Advertising Vigilance Committee Rules Against Storage Battery Advertiser

THE Radio Dry Storage Battery Company, of Chicago, has advertised its "Radio Dry Storge Battery" as—

"OUR GUARANTEE. Each RADIO DRY STORAGE BATTERY carries with it a THREE-YEAR UNCONDITIONAL GUARANTEE, on adjustment basis."

The guarantee has been further described and referred to in the company's advertising as—

"EXIT REPAIR BILLS. Our strong GUARANTEE eliminates repair bills entirely, giving the consumer a new battery at once if anything goes wrong with his battery."

"Backed by an Iron-Clad Three-Year Written Guarantee."

"It is guaranteed under an unconditional three-year guarantee."

The above phraseology would lead a prospective purchaser, to believe that a battery procured from this manufacturer bore an unconditional guarantee for three years, and that should the battery require replacement or repair, within the period stated, he might expect same *free*.

The guarantee which the company actually gives is this: If the battery has been used for ninety days or less, it is replaced free of charge, but if it has been used for over ninety days, it is replaced only on payment of an "adjustment," computed at the rate of 2 cents per day. In reality, the battery is unconditionally guaranteed for ninety days; it is thereafter guaranteed on an adjustment or conditional basis, contingent upon the payment of a service charge. Adverised as an "unconditional guarantee" and as entirely eliminating repair bills, replacement under these conditions could occasion an expense of $10, $15, or even $20 or more.

In view of the discrepancies between the advertised guarantee and the guarantee really given, the National Vigilance Committee is of the opinion that this advertiser's copy is decidedly misleading, and cannot recommend it.—*Advertising Club News.*

Managers and Music Publishers Stop Fighting Radio—Now Utilize Its Advantages

RADIO is rapidly battering down many prejudices. It is not so long ago that theatrical managers and music publishers would have nothing to do with radio or at least they refused to join hands with it in any endeavor to entertain the public. RADIO WORLD announced recently that Marcus Loew had taken over the WHN station and installed it in his State Theatre Building on Times Square, New York City. Now along come the music publishers including E. C. Mills, head of the Music Publishers Protective Association, with a special event the chief items of which were broadcast by Station WJZ. In other words, managers, music publishers and others are taking the stand that so long as radio is too strong to fight they might just as well avail themselves of its advantages.

Paul Specht, orchestra leader, and the members of his band, who have just returned from a successful musical invasion of England, were tendered a reception and dinner by their friends in the musical profession at the National Vaudeville Artists Clubhouse, New York, last Monday evening. This is the best equipped and most beautiful theatrical clubhouse in the world.

Theatrical folk and others all over the country who were not able to be present listened in on radio and sent congratulatory telegrams saying that they approved of everything that was going on and wished to be there.

E. F. Albee, head of the B. F. Keith Circuit, sent a congratulatory letter to Mr. Specht and his men. C. E. Mills was master of ceremonies and Jack Bliss acted as toastmaster. Many prominent musicians, civic officials and members of the theatrical profession were present. Specht was given a diamond and pearl set of studs as a token of esteem.

New Radio and Electric Firms

Speeddee Specialty Co., New York City, radio and electric machines, $5,000; H. and R. A. Dejur. (Attorney, H. Levin, 15 Park Row.)

Twin-Boro Electrical Service Co., Brooklyn, N. Y., $5,000; N. and L. A. and A. M. Goldberg. (Attorney, J. G. M. Browne, 280 Broadway.)

Maritime Electric Co., New York City, contractors, $20,000; J. J. and H. T. Gill, J. J. Tyson. (Attorney, J. A. O'Brien, 1402 Broadway.)

Interboro Radio Corp., New York City, make instruments, $10,000; L. Israel, M. Salpeter, D. I. Goldstein. (Attorneys, Cohen & Goldfarb, 302 Broadway.)

H. J. Siebert, Manhattan, electrical and engineering work, $50,000; C. C. and H. J. Siebert, E. Holzer. (Attorneys, Feldman, Streicker & Goldman, 154 Nassau St., New York City.)

American Battery Specialty Co., $250,000; H. Lindale Smith, M. L. Merchant, C. H. Patterson, Cleveland, Ohio. (Attorney, Homer J. Smith, Wyoming, Del.)

Niagara Electric Supply Company, Niagara Falls, N. Y., $20,000; F. C. and S. C. Wisbaum, M. Rabin. (Attorneys, Moore & Killian, Niagara Falls.)

Link Hemrick, New York City, make batteries, $10,000; C. W. Link, H. Hemrick. (Attorney, S. Brinn, 63 Park Row.)

Fixtureller Corp., New York Yity, electrical supplies, $20,000; M. Schimel, A. King, A Waiss. (Attorneys, Drechler, Orenstein & Leff, 225 Fifth Ave.)

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"VERILOUD"
SYNTHETIC
RADIO CRYSTAL
ON APPROVAL FOR 30 ¢
ZOBEL-STEIN LABORATORIES
322 9TH ST. BROOKLYN, N.Y. SOUTH 2650

WD-11 and WD-12
TUBES REPAIRED

WD-11 or WD-12	$3.50
C-300 or UV-200	2.75
C-301 or UV-201	3.00
C-302 or UV-202	3.50
C-301A or UV-201A	3.50
Moorehead Detectors	2.75
Moorehead Amplifiers	3.00
DV-6 or DV-6A	3.00
Also the new UV-199	3.50

All tubes guaranteed to work like new.
Mail Orders Given Prompt Attention
"24 Hour Service"
NEW DX 1½ VOLT TUBES..... $4.00
RADIO TUBE CORP.
55 Halsey Street Newark, N. J.
TUBES SENT PARCEL POST, C. O. D.

National Association of Broadcasters Supplies Members with Music

L. BAMBERGER & COMPANY, Newark, N. J., owners and operators of Station WOR, have announced that they will appeal to the United States Supreme Court the decision handed down against them recently by Judge Lynch. As announced in RADIO WORLD last week, this was in the case of M. Witmark & Sons, music publishers of New York City, against the Bamberger firm for broadcasting copyrighted music. Judge Lynch decided that such use of the music violated the copyright law and he naturally expects to be sustained by the Supreme Court. As far as broadcasters are concerned they are confronted by the Judge Lynch decision, which plainly states in effect, that they cannot broadcast the music of the American Society of Composers, Authors and Publishers, without taking out a license.

Now, what have the broadcasters themselves done to meet this situation? A meeting was called at the Drake Hotel, Chicago, on April 25 and 26, 1923, which was attended by most of the prominent broadcasters in the United States, as noted in RADIO WORLD at the time. The general manager of the American Society of Composers, Authors and Publishers, came from New York and addressed the meeting. His proposals, however, made a decidedly unfavorable impression upon the men assembled, and it was therefore decided to form the National Association of Broadcasters. Counsel was retained. Paul B. Klugh took active charge of the affairs of the association, with the title of executive chairman. Offices were established in New York and plans were put into operation for placing the new organization upon a practical operating basis. A fund was provided adequate to meet all financial requirements for a period of years and a constitution and by-laws were adopted containing the following purposes:

To foster and promote the development of the art of radio broadcasting and the interests of those engaged in any business, profession or industry relating or pertaining to radio broadcasting; to reform abuses relative thereto; to secure freedom to its members from unjust and unlawful exactions; to procure uniformity, equity and certainty in customs and usages of trade and commerce relating thereto; to settle differences between the members, and to promote a more enlarged and friendly intercourse between members; to secure co-operative action in advancing the common welfare of its members and proper consideration and concentration of opinion upon questions relating thereto; to advocate the enactment of just and equitable laws pertaining to or affecting radio; to support every movement to advance the radio art, and to encourage and aid in the development of musical and literary genius, especially where such genius has not had proper recognition.

Among other activities, a Bureau on Music Release was established. It is headed by Raymond Walker, an experienced song writer and publisher, who has a corps of skilled and able assistants. This bureau has invited song writers and publishers to send their music to the executive offices through display advertising in periodicals read by song writers, announcements by members over the air and thousands of letters sent out. As a result several thousand musical compositions have been received of varying degrees of merit. These are all put through systematic tests—less than 10 per cent. have been found acceptable—but where a song bears evidence of becoming a so-called "hit" and has clean lyrics, it is released by the National Association of Broadcasters.

Since July 1, this music service has been going out to members of the national association. The music is of a great variety, and, in the opinion of many, of a better quality than that controlled by the American Society.

Members of the National Association of Broadcasters, therefore, are not worried about the Judge Lynch decision. They are not even interested in it, because they are receiving an ample supply of good music which permanently frees them from any demands similar to those so unjustly made by the avaracious American Society of Composers, Authors and Publishers.

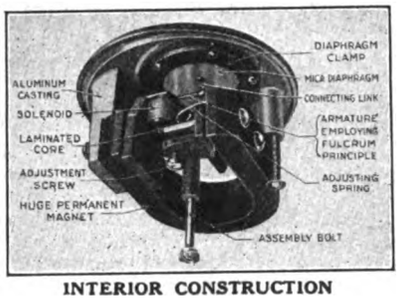
Aid for Canadian Radio

GOVERNMENT aid to the extent of $55,000 has been extended in Canada for the purpose of establishing radio stations at McMurray, at the end of the railroad in Northern Alberta; Fort Simpson, on the MacKenzie River; and Dawson, in the Yukon, according to reports just received at the Department of Commerce. The new stations will displace the land lines at present in use from McMurray northward, for which the Canadian Government has appropriated from $275,000 to $300,000 annually for the past 23 years.

THE TRINITY LOUD SPEAKER

TYPE "A1"
21" FIBER
HORN
$25.00

TYPE "B"
(For Phonographs)
$12.50



INTERIOR CONSTRUCTION

An ear phone is an ear phone no matter how fancy the horn that covers it may be, and, due to the delicate construction of an ear phone it is utterly incapable of giving true tone reproduction, especially, when relatively large currents are passed thru its coils, such as the output of a two-stage or power amplifier.

The Trinity Loud Speaker element embodies the well-proven and tested principles of the phonograph reproducer with the soundest principles of electromagnetic design best adapted for loud speaker operation. It is not an ear phone when placed on a head band and a loud speaker when covered with a horn. It is a sturdy loud-speaking element ALWAYS.

Send for Literature.

TRINITY RADIO CORPORATION
446 TREMONT STREET, BOSTON, MASS.

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD *1493 Broadway, New York City*

Please send me RADIO WORLD for ..... months, for which please find enclosed $.....

SUBSCRIPTION RATES:
Single Copy .....$ .15
Three Months 1.50
Six Months 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year to Foreign Postage; 50c for Canadian Postage.

.....
.....
.....

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The Wireless Oracle Speaks

By Hirsch M. Kaplan

Irene Owens, who sang through station WOR, has a voice like a nightingale.

* * *

WDAR comes through at all hours these days. Your programs sure are the cat's pajamas. Keep it up!

* * *

Fine stuff, WAAM! You sure have some of the larger stations beaten.

* * *

See where "M. T. G." (the gentlemen who won't divulge his name) announcer at WHN, is copying your style, Roxy. Never mind though—you're still miles ahead of your closest competitor.

* * *

Edward Yap sure can "Say it with a ukulele."

* * *

Now that you've come under new ownership, WBS, let's hope that there will be an improvement in your station.

* * *

Say WHN, when you were over in Ridgewood, as our Dr. Coue would say, "Day by day in every way you were getting better and better." Now, in your new home, although your volume is good, your modulation is terrible. Too bad, as the programs you are offering leave a poor impression.

* * *

Mustn't forget our ever ready friend, Fred Bendell, sporting editor of the Newark "Sunday Ledger." Your talks, I can safely say, are enjoyed by all.

* * *

KDKA broke through with the 100 per cent. Westinghouse Band, which sure was the bee's knees.

* * *

WDT, you may be trying your darndest, but, as Rube Goldberg of the Evening Mail says, "It don't mean anything." We B. C. L.'s are from Missouri and we've got to be shown.

* * *

WSB came through with a 75 per cent. Radiowl Concert.

* * *

Gdubb, the sax player of the Lucky Strike Operators, certainly can blow some very peppy songs through his instrument.

* * *

Robert and Merrill Pollock are some jazz songsters. Did you hear them from WJZ the other night?

* * *

Have you ever tuned for a DX station just when the time signals are being transmitted by the various stations, then suddenly you stop on hearing sounds like that of a clock, thinking that you had station PWX of Cuba, only to listen patiently for the announcer and then hear him say, "This is station WHAS?"

* * *

Suppose you've all forgotten by this time that there ever was a station WJY? Well, just let me remind you that this station is still on the air every Sunday afternoon from 2.30 to 6.30.

* * *

Miss Leonia Adams sure is a "second best" to Alma Gluck. That's saying something!

* * *

The radio musical fans' delight—the New York Philharmonic Concert Orchestra and Franko Goldman Band. What say you, lovers of good music?

* * *

Dave Saperstein certainly can tickle the ivories and, as Roxy would say, "Bravo!"

* * *

Did you hear the reception given Paul Whiteman on his return from a London engagement? There were at least five orchestras and three popular male singers. They sure were some Jazz Boys. To put the finishing touches to the ceremonies Paul was crowned Jazz King.

* * *

If you didn't tune in WHAZ the other night and hear the nine-year-old Beatrice Gilbert tickle the ivories then you missed a treat. Another prodigy!

* * *

Suggest that Earl Dana do a few hours "mike" practice before he broadcasts again. Although an excellent literary critic, his style of delivery over the radio leaves much to be desired.

* * *

The First Baptist Church of Worcester, Mass., will be on the air shortly with "This is station WBAK, 252 meters."

* * *

When it comes to bedtime stories and such, there are few stations that can beat WIP's "Uncle Wip." Somehow or other he sounds convincing, and that's the quality which is lacking in most sandmen.

Army Radio Service Pays

THE army radio net, valued at approximately $500,000, made a return to the Government of over 10 per cent. during the past fiscal year, on paper. From June 30, 1922, to July 1, 1923, the traffic handled by the Signal Corps radio net would have cost the Government $66,375 at government rates, via commercial wires. The actual cost of these operations was $13,840, which shows a paper saving of $52,535. Actually official messages are handled without cost, and the few private and commercial messages handled, where other radio service is not available, is charged for at slightly over commercial rates, the money being turned over to the Treasury of the United States.

During the fiscal year ended July, 120,968 official messages were handled by the Army's Message Center in the Munitions Building in Washington, D. C.

In the army's radio net there are today thirteen main stations, 43 corps area stations and 12 air service or flying field stations, making 68 principal stations. In addition, there are auxiliary stations which bring the number to 112 radio stations.

LAUGH at Your LANDLORD

If he refuses to allow the construction of an aerial. The LEVIN "NO-AERIAL" RECEIVER solves the problem in an economical way. Just connect your Levin "No-Aerial" receiver to the water pipe or radiator and listen in. This receiver requires ONLY a ground connection for perfect reception. Send stamp for further information or $1.00 for plans and specifications, including full-size panel layouts and instructions.

RADIO EQUIPMENT COMPANY

727 W. 8th St. JUNCTION CITY, KANSAS

Sebring, Fla., heard Honolulu. A man writing from Nassau, British West Indies, says, "First of all on Friday night last June 29, 1923, I heard Honolulu." These records were made with a Crosley Model X. Thousands of letters have come to us unsolicited, telling of the wonderful performance of this instrument.

The new Model X-J, combining all the features of the Model X, with greater refinement of detail, is even better. It is a 4-tube set incorporating one stage of tuned radio frequency amplification, detector and two stages of audio frequency amplification with jack to plug in on three tubes for head phones, new Crosley multistat, universal rheostats for all makes of tubes, new condenser with molded plates, filament switch and other added features.

We believe the Crosley Model X-J to be the most efficient radio receiver ever offered to the public regardless of price. Write to-day for free catalog describing the Model X-J and other Crosley receivers and parts.

For Sale by Good Dealers Everywhere.

Crosley Mfg. Co.
9401 Alfred Street
Cincinnati, Ohio

SEND THIS COUPON

Crosley Manufacturing Co.,
9401-9403 Alfred St., Cincinnati, Ohio.

Gentlemen: Please send free of charge your complete catalog, together with your booklet entitled "The Simplicity of Radio."

Name .....

Address .....

FOR RELIABLE UP-TO-DATE

RADIO MAILING LISTS

Use Our Card Catalog Directory in use now with over 200 Radio Manufacturers and Jobbers

Your ENVELOPES ADDRESSED At $2.00 per 1,000

Write for Particulars

Sydell's Radio Trade Directory

406 W. 31st St., New York. Watkins 5967

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

Do You Want LONG DISTANCE on Your Set?

The following stations have been heard with a COAST COUPLER

WDAP—Chicago
CFCN—Calgary
WWJ—Detroit
PWX—Havana
WSB—Atlanta

And Many More

The COAST COUPLER is a necessary part of your radio hook up. Manufactured of the best materials obtainable and thoroughly tested before leaving the factory. It has immediately won recognition in the radio market.

ANYWHERE IN THE UNITED STATES—$5.00

Dealers and Jobbers Investigate

COAST COUPLER COMPANY

245 EAST SEVENTH STREET LONG BEACH, CALIFORNIA

RADIO WORLD IN THE PUBLIC LIBRARIES

Many public libraries throughout the country are sending in their subscription orders for RADIO WORLD.

Librarians evidently have made up their minds that the visitors to their libraries are anxious to read articles about and see pictures of the latest developments in radio when they are news.

If your library has not placed RADIO WORLD on file, tell your local librarian how interesting and important is this once-every-seven-day radio paper.

Address: RADIO WORLD, 1493 Broadway, New York, N. Y.

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The Potentiometer Did the Trick

EDITOR, RADIO WORLD: I have noticed in several of your past issues that your writers have made particular note of potentiometers in the circuit. I recently constructed a two-stage radio-frequency set from a plan submitted by a local "radio expert." I have had rather indifferent success with it, as one night it would seem to work right and other nights it would not work satisfactorily at all.

I noted that most all the circuits in RADIO WORLD using radio-frequency amplification also used a potentiometer. I pondered over this for some time and finally installed one. It was a simple job, and not as hard as I had expected. I must say that I have improved my set by its use.

As an illustration, I used to get WLW just faintly readable at times, while at other times it was fairly strong. Since I have installed the potentiometer I have been able to bring in that station, as well as many others fine and without the tubes seeming to "jam."

I want to thank you for your advice in the matter, even though I am not a believer in "do-dads" in a receiver.

Hope anybody who has trouble in using radio-frequency amplification will be helped by my experience. I said that it was greatly improved. In thinking it over, I believe that an improvement value of 100 per cent. will not be an exaggeration.

Yours truly,
Ridgewood, N. Y. JAMES MORTON.

Bureau of Standards Reports on Amplification Measurements

MEASUREMENTS of voltage amplifications of audio-frequency amplifiers are discussed in Letter Circular 98, which has just been issued by the Bureau of Standards for free distribution. This circular gives the results of voltage amplification measurements made on 16 audio-frequency amplifiers which were on the market during 1921-22. All these amplifiers employed transformer coupling. Measurements were made over a frequency range of 400 to 2100 cycles per second. The amplifiers studied are referred to by arbitrary reference numbers rather than by a statement of the manufacturers' names and model number, the method followed being the same as that used in measuring the voltage amplification of amplifiers, the subject of Letter Circular 86.

It is believed that the examples given in this report will be of assistance to manufacturers in testing and describing their own products and will thus lead to their improvement.

Government Radio Directory Out Soon

LISTS of broadcasting, amateur, Government and ship and land commercial stations have been prepared and transmitted to the government printer for use in the forthcoming directory of stations, which will be available in about six weeks.

These lists are issued annually, giving all stations in service at the beginning of the fiscal year, on July 1. Two books are issued—one covering commercial, Government and broadcasting stations and the other amateur and special stations. Each station is listed twice, by name of owner and by call, and the lists are arranged by districts, in the case of amateur and special stations, and alphabetically in the case of all other stations.

Announcement will be made in these columns when the lists are ready for distribution.

EXTENDED FOR 20 DAYS EXTRAORDINARY SUMMER SUBSCRIPTION OFFER

Radio World and Other Popular Radio Publications for the Price of Subscription for Radio World Alone

Radio World has made arrangements
—by which it is possible
—to offer a year's subscription for
—any one of the following publications
—with one year's subscription for
—Radio World:
—RADIO NEWS or
—POPULAR RADIO or
—WIRELESS AGE or
—RADIO DEALER or
—RADIO (San Francisco)

This is the way to get two publications
—for the price of one:
—Send $6.00 today for Radio World
—for one year (regular price
—for 52 numbers)
—and select any one of the other
—four publications for twelve months—
—Add $1.00 a year extra for
—Canadian or Foreign postage.
—This offer good only up to and
—including September 20, 1923.
—Present Radio World subscribers
—can take advantage of this offer by
—extending subscriptions one year NOW.
—Or order thru your newsdealer.

RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK

RADIO WORLD, 1493 Broadway, New York City.

Enclosed find $6.00, for which send me RADIO WORLD for twelve months (52 numbers), beginning ....., and also, without additional cost, Radio News, or Popular Radio, or Wireless Age, or Radio Dealer, or Radio for twelve months beginning .....

Name .....

Street Address .....

This Offer Good Only Until September 20, 1923

City and State .....

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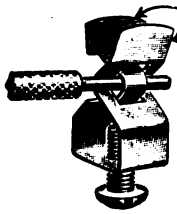
Build Your Own
HAZELTINE
NEUTRODYNE
with
FREED-EISEMANN
Licensed Essential Parts

Complete wiring diagram, instructions, etc. sent in special container with patented essential parts. Three NEUTROFORMER COILS mounted on variable condensers, and DOUBLE NEUTRODON (as illustrated), sent for $24.00. Ask your dealer to show you these parts, as well as complete assembled five-tube Neutrodyne Set in mahogany cabinet, Model NR-5, $150.

Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

FREED-EISEMANN RADIO CORPORATION
255 Fourth Avenue New York
Licensed by I. R. M. Inc. Under Hazeltine Patents

PERFECT CONNECTIONS



Are Always Sure With Fahnestock Patent Wire Terminal
Grips Like a Vise
Eliminates Vibrations
Easily Attached
No Soldering
Best of All for RADIO OUTFITS
Clip No. 45 (Illustrated) especially adapted for bus wire.
Made in all Sizes and Shapes
At your Dealer's
FAHNESTOCK ELECTRIC CO.
EAST AVENUE AND 6TH STREET
LONG ISLAND CITY, NEW YORK

Rametra CORPORATION
In Stock—
All Parts
For the
ACMEDYNE CIRCUIT
Tuned Radio-Frequency at Its Best
Described in detail by Mr. Lawrence Cockaday in the August "Popular Radio" and recommended by experts in all parts of the country.
Write or call for complete particulars and prices.
Radio & Mechanical Trading Corp.
23 Warren St. New York

Federal Standard
Radio Products
Standard of the Radio World, 130 separate units, each fully Guaranteed.
Write for Catalog.
Federal Telephone and Telegraph Co.
BUFFALO, N. Y.

Don't Ask for Rheostat—Say
FIL-KO-STAT
FOR REAL FILAMENT CONTROL

Radio Equipment for a Philadelphia Hotel

NOT only has the Philadelphia public been bitten with the radio bug, but apparently the more prominent hotel and apartment house owners and engineers also have decided that radio benefits are to be a future added convenience to the comfort of their tenants.

The Pennsylvania Hotel, which is rapidly nearing completion at 39th and Chestnut streets, Philadelphia, contains upward of 600 rooms divided into 140 single rooms and baths and 160 suites ranging from two to six rooms and baths, each completely equipped with dining room and kitchenettes, making it the second largest hotel in Philadelphia and the second largest hotel of its type in the United States. It is to be equipped with one of the most modern and comprehensive radio systems in the world, to be installed by Durham & Company, Inc., radio engineers of Philadelphia, using Western Electric equipment throughout.

A special radio room has been built upon the roof, which will be equipped with a modern type receiving apparatus connected to powerful amplifiers distributing the received radio features from local and distant stations to the main dining room, the lobby, the lounge, smoking room, banquet hall, and grill, separately or to any of these locations simultaneously. The distributing apparatus consists of projectors, or as they are commonly known, "loud speakers," of special design made by the Western Electric Company, and giving a much better quality to the received energy than is present with the usual type of loud speaker.

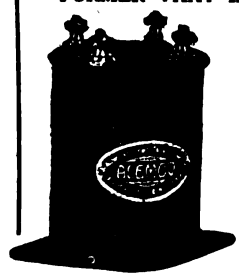
Another novel feature about this particular installation is the paging system that is to be inter-connected with the radio equipment for the halls and lobbies. For example, the telephone operator sitting at her switch board can, by plugging in a microphone, talk to any one or all of the output stations and make whatever announcements she may desire. In this manner the paging of the tenants and guests is accomplished and announcements of importance may be made to the diners or individuals in various parts of the hotel.

No longer will it be necessary for diners to sit at their tables after having eaten to enjoy the orchestra music, for microphones are to be placed near the orchestra and music sent along wires to the lobbies, and lounges, throughout the Pennsylvania Hotel. Also, the transmission of lectures or speeches from any one of these locations is to be re-transmitted to all gathering places in the hotel, thereby greatly increasing the audience present and distinctly adding to the speaker's appeal.

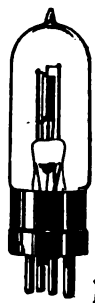
The tendency of the enterprising builder and engineer is very rapidly approaching the inclusion of the most modern devices of this kind in their building plans. The installation of a mammoth radio equipment of proper design is naturally a problem which would be different in each case and which must be solved by specialists in this newer type of engineering. The term "radio engineering" is hardly an adequate term to cover the problems that are involved, and fortunately the past experience of our telephone engineers in the amplification of sound has very materially assisted this new art.

RUSONITE
CRYSTAL RECTIFIER
(Patent Pending)
THE PERFECT SYNTHETIC CRYSTAL DETECTOR—SENSITIVE OVER ENTIRE SURFACE
No Hunting for "Spots." Loud and Clear. Endorsed by Thousands of Satisfied Users.
Sensitiveness Guaranteed — Price Mounted 50c
14 K. Gold Supersensitive RUSONITE CATWHISKER. Price 25c
Permanent. Will not Oxidize.
RUSONITE REFLEX CRYSTAL
Manufactured Expressly for Reflex Circuits. Will Stand Up Under Heavy Plate Voltage.
Guaranteed — Price Mounted $1.00
Order from your dealer or direct from RUSONITE PRODUCTS CORP.
15 Park Row New York, N. Y.

AN AUDIO FREQUENCY TRANSFORMER THAT IS WORTH WHILE
ALEMCO



Specially designed to produce superior results with any standard tube. Produces maximum amplification without distortion or howling. Moisture, hard knocks and abuse will not affect its efficiency.
Windings completely surrounded with laminated iron and sealed in a non-inductive bakelite housing eliminating leakage. Adaptable to any stage of amplification.
Ratio 4 to 1
The Alemco Coil also gives equal or better results on the first stage than transformers on the market wound as high as 9 or 10 to 1.
Will stand any voltage.
Price, $5.50 Postpaid
ALEMCO, Poughkeepsie, N. Y.



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RADIO TUBES

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UV-200....	2.50	UV-201A.	3.75
UV-201....	3.00	C-301A...	2.75
C-300.....	2.50	UV-202...	4.00
C-301.....	3.00	C-302.....	4.00

Mail orders solicited and promptly attended to.
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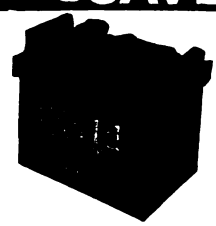
YOU SAVE 50% OF THE USUAL COST



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Will ship C. O. D. subject to inspection, or allow 5% discount for cash with order. Order shipped same day received. WRITE TODAY.
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2 VOLT STORAGE BATTERY for WD11—WD12 $5.00
6 V., 60 Amps. $10.00
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PANELS BLACK AND MAHOGANITE
DIALS—KNOBS
20 Stock Size Panels and Also
CUT TO ANY SIZE
"Radion" Tubing: 2", 2½", 3", 3½", 3½", 4", 5"
Cut to Any Length
Special Parts Experimental Work
Made to Order
N. Y. Hard Rubber Turning Co.
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Radio World Wants Pictures of Radio Fans

Have you had a picture of yourself taken in connection with your radio set? If so, we should be glad to use it in Radio World. All you have to do is to send us the photograph, writing carefully on the back your name and address together with a few words of description telling what kind of a set you operate, etc., etc. Send this to the Art Editor of Radio World and we will use it without any expense to you whatsoever in an early issue of Radio World.

Photographs will be returned to senders when accompanied by return postage and when so requested.

Art Editor, RADIO WORLD, 1493 Broadway, New York City.

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio and other fields. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get an eight-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands eight days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office eight days before publication. RADIO WORLD, 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

DETECTIVES NEEDED EVERYWHERE—Work home or travel. Experience unnecessary. Write, American Detective System, 1968A Broadway, N. Y.

RADIO SET—Extremely sensitive tuner and one step in 8x18 walnut cabinet. I hear Kansas City Star; Omaha, Neb., etc. Atwater Kent parts. Complete with two WD11 tubes and phones, $70 postpaid. Address, Garth Showers, Tannersville, N. Y.

RADIO FANS AND PROFESSIONALS—How many know the correct CODIFICATION of all characters, punctuations and signs (such as $, %, etc.)? Nine out of ten don't! Our instructor who has had 35 years experience (eight years of which with Uncle Sam) as MORSE and RADIO telegrapher, has just published the only CHART known to give fully the correct codification of all characters of both codes. This chart is indispensable to all up-to-date beginners and veterans alike. Fifty cents (money order preferred) will bring chart; also much information extremely interesting to young men and women (18 to 70) with this information and a little PEP on your part, you can qualify shortly (as scores of our graduates have done) and secure positions paying $1,500 to $3,000 yearly. (See Civil Service Bulletins 215, 357 and 54.) We are registered with the U. S. Civil Service Commission at Washington and can help you. AMERICAN TELEGRAPHIC STUDIO, BOX 793, WORCESTER, MASS.

FOR SALE—De Forest Portable Radiophone Transmitter. 5-watt bulbs; new, $100 net F. O. B. P. O. Box 33, Red Bank, N. J.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

WANTED—One K. W. used Navy Quenched Spark Gap. Also Price wanted. Harvard Radio Laboratories, P. O. Box 1781, Boston, Mass.

60,000 MILES ON A HOME-MADE RECEIVER. 2,600-mile range. 100 station log and hook-up for the asking. Maitland Roach, 2908 Columbia Ave., Philadelphia, Penn.

LEARN THE RADIO CODE in 3 hours or less by the Corydon Snyder Code Method. Money back if not satisfied. 50 cents postpaid, or particulars for stamp. Corydon Snyder, 1161 So. Ridgeland Ave., Oak Park, Ill.

MAGNAVOX TYPE R3—Latest curvex, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kan.

OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

THE AMATEUR ELECTRICIAN explains the "How and Why" of electricity with plans for making and operating wireless, telephones, electric bells, toys, novelties, etc. Over 70 illustrations, 64 pages. Only 10c. R. W. Collins Co., 197 Fulton Street, Brooklyn, N. Y.

EDISON Elements for making "B" Batteries, 6c per pair; tubes, 2c each. Nickel Wire, Insulators and Cabinets at reasonable prices. TODD ELECTRIC CO., 178 Lafayette St., New York City.

150 FUNNY PARODIES on latest songs, 25c. Book catalog, 2c. R. W. Collins Co., 197 Fulton St., Brooklyn, N. Y.

GET OUR PRICES on Plate and Filament Heating Transformers. L. Werts, 409 St. Julian St., Pekin, Ill.

ALL ESSENTIAL PARTS FOR building Neutrodyne Receiver, complete instructions, etc., $21.50 C. O. D. Reinartz tuning coils, $1.50. R. Schwartz, Buchanan, Mich.

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

SECOND-HAND Westinghouse R. C. Regenerative receiver, consisting of detector and two-step amplifier, $65.00. Three Erla Radio Frequency Transformers, $6.00; Crosley two-step amplifier, $14.00. All of the above is good as new and will work with all standard bulbs. Address Randolph Whitehand, Albany, Georgia.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, tape or radio frequency. Nothing to guess about. Complete hook-up and particulars. $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

FOR SALE—Three Radio Corporation, 200 to 5000 meter radio frequency transformers, like new, fine for superhetroydne, $5.00 each. Fine Phonograph attachments, needle operating kind. Guaranteed good as Magnavox, $10.00 each. Any of above sent post paid, collect, on receipt of $1.00. Everything sold on money-back guarantee. RAYMOND MOORE, Box 404, Lakeside, Ohio.

RADIO WORLD'S

FALL BUYERS' NUMBER

DATE OF IMPORTANT ISSUE—OCTOBER 6

(LAST BLACK FORM CLOSES SEPTEMBER 27)

Hundreds of thousands of radio enthusiasts who will be returning from their vacations, to say nothing of the army of new radio fans that will come into the radio fall season for the first time, will look forward to the buying of sets and general radio equipment in the autumn. Radio World will devote a special issue to these potential purchasers of goods—the **FALL BUYERS' NUMBER.**

Our regular advertising rates will be in force as follows: $5.00 per inch, single column $50, $150 per page, with discounts of 10% four times, 15% thirteen times, 20% fifty-two times (yearly) contract. Classified, 5c a word.

Special service and value to advertisers in Radio World's **FALL BUYERS' NUMBER.** All advertisers who give us copy for quarter page or more space in Radio World's **FALL BUYERS' NUMBER** will, on request, have their announcements appear in **two colors at the price of one**—in case copy is in our hands by September 22.

Radio World is already at work on a country-wide circulation campaign for **FALL BUYERS' NUMBER,** which will be so interesting from a pictorial and text standpoint that it will have an unusually large sale and advertisers will receive unusually fine value.

Write, wire, or phone now for special positions

RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

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FOR RADIOISTS, ELECTRICIANS, AND OTHERS

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The Radio Experimenter's Hand Book—By M. B. Sleeper..... 1.00
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Radio Design Data for Radio Transmitters and Receivers—By M. B. Sleeper..... .75
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How to Make Commercial Type Radio Apparatus—By M. B. Sleeper..... .75
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Experimental Wireless Stations—By P. E. Edelman 2.00
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THE COLUMBIA PRINT

RADIO WORLD

TELEPHONE, BRYANT 4796
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President and Editor
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.
European Representative: The International News Co., Breams Bldgs., Chancery Lane, London, Eng. Paris, France: Brentano's, 37 Avenue de l'Opera.

Managing Editor: Stephen L. Coles
Technical Editor: Robert L. Dougherty

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Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.
Add $1.00 a year extra for foreign postage. Canada 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Here's an Amateur Who Wants Help

EDITOR Radio World:—I would like to state that I was greatly enthusiastic about radio formerly, but sad to relate my enthusiasm has disappeared entirely due to the following: I possess a Flewelling set that does not work which I purchased in good faith. It worked at first poorly and the tube which I purchased only lasted two weeks. I then had the hook-up changed by someone whom I thought knew something about radio, but really knows nothing, and the set stopped entirely. My proposition is as follows: If any successful Flewelling fan will change the hook-up of my set, which is all that is necessary in order to make it work successfully, I will purchase a new tube and try to regain my lost enthusiasm. This latter will prove whether the readers of the Radio World are really willing to help a radio fan who has tried to reap the joy of radio, but has only suffered disappointment, by their response to the above letter.

I thank you for your kind attention and hope that you will publish the above letter.

Yours respectfully,
JULIUS MILLER.
121 West 114th St.,
New York City.

Not Important at Present to Buffalo

EDITOR, RADIO WORLD: Referring to your letter of July 23rd, it is possible that in the future a municipal broadcasting station may be deemed necessary, but at the present time there are many other things which seem more important.

Yours very truly,
FRANK X. SCHWAB,

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Distance, Volume, Very Select Tuning. Easiest Set to Operate. Easily Assembled.

GUARANTEED TO WORK or money back

You Get the Following:

Genuine mahogany cabinet, 1 drilled grade A hard rubber panel, 1 23-plate condenser, 1 variometer, 1 rheostat, 1 tube socket, 2 3-inch dials, 8 initialed binding posts, 3 lengths spaghetti, 3 lengths bus wire, 1 grid leak and condenser, 1 diagram.

All Best Standard Parts.

ONLY $6.90 WHY PAY MORE?

Diagram Alone, 50 Cents; Circular Free

Scientific Radio Laboratory
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Reinartz Coil $1.85

The Improved Basket Weave, Covering All Broadcasting Wavelengths

With each coil we send FREE two large blueprints, picture hookup and panel layout, list of materials, and fully illustrated instructions for construction and operation.

Buy before the fall rush sets in.

We sell all parts required for this wonderfully efficient receiver—panel, coil, condensers, socket, vernier rheostat, variable grid leak, dials, switches, posts, contact points, wire, spaghetti, etc. (no tubes or phones) for only $9.85. Postage additional on all shipments.

Send no money. PAY THE POSTMAN. All goods shipped Parcel Post C. O. D.

RADIO SURPLUS STORES
HELENA, MONTANA

STOP—LOOK—LISTEN

C. White's "Super-Amplifier" completely assembled with two UV-201A tubes **$38.00**

A real Push-Pull Amplifier bargain.

Write NOW

COREY HILL BATTERY CO.
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Pruden Reliable Radio Specialties for Good Results

Dealers write today for our interesting proposition.

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Through the accuracy and dependability of Freshman Condensers, hook-ups and circuits have been perfected which have completely revolutionized the art of Radio Reception.

These little Storers of energy and rectifiers of Radio Current are the very heart of a well-built radio set.

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Capacity	Each	Capacity	Each
.0001	$ .35	.002	$ .40
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.0002	.35	.004	.75
.0002	.35	.005	.75
.00035	.35	.006	.75
.0005	.35	.008	1.00
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The FRESHMAN is so designed that constant equal pressure is exerted on the condenser plates over the entire area. They are the only condensers that do this and therefore the only condensers that avoid noises, which are due to variable pressure on the plates.

At your dealers, otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
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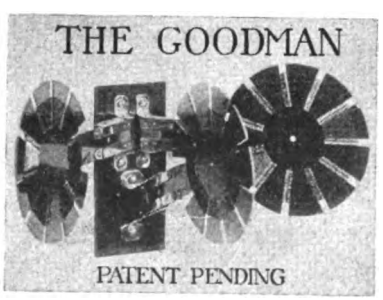

The Niftiest Short Wave Tuner on the Market Only $6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

Mr. C. H. Jenkins, Audubon, N. J., writes:—"On July 13th, tuned in WBAP, Fort Worth, Texas, (476 meters), with the GOODMAN, while WDAR (396 m.) and WOO (509 m.), powerful local stations, were broadcasting dance music."

New Magnavox Products

AN announcement of interest to every radio user has been made by the Magnavox Company regarding the introduction of important additions to their already famous Magnavox line of reproducers and power amplifiers. Among these new models are the Magnavox combination sets A-1-R and A-2-R; a new Magnavox reproducer M-1 and a new one stage Magnavox power amplifier A-1. The combination sets consist of the electro-dynamic Magnavox reproducer with 14 inch curvex horn and a Magnavox audio-frequency power amplifier (one or two stage) incorporated in a new type of radio unit which might be termed an "amplifying reproducer."

This combination forms a highly desirable unit for addition to any radio receiving set, giving the user the utmost in adaptability and efficiency.

The rheostats (maximum resistance 30 ohms) and circuits are so arranged in Magnavox combination sets that five-watt transmitting tubes or any type of amplifying tube may be successfully used, thus covering the widest possible range of operating conditions from the smallest home to the concert hall.

These instruments are also equipped with a modulating device for controlling volume, another unique Magnavox feature. Binding post terminals are provided by bakelite panels on the back. The case is of heavy metal forming a shield against outside forces, and is attractively finished in dark crystallized enamel. "On" and "off" switches are provided on top of the case.

Another interesting and important Magnavox product is the M-1 reproducer with 14 inch curvex horn. This instrument is of the semi-dynamic type and has been developed by Magnavox engineers along original principles to meet the requirements of dry battery receiving sets, as it consumes no current from the battery. The Magnavox reproducer M-1 is particularly recommended where low voltage and low current tubes are used. The base is equipped with a five foot flexible cord and has binding posts for extensions. The standard finish is crystallized black but the M-1 is also furnished in special de luxe polychrome finish at the same price.

While these new types of Magnavox instruments are of great interest as being radically different from anything previously manufactured by this company, many users will also welcome the new Magnavox one-stage power amplifier A-1. This, in many cases, is just what is needed to bring in and reproduce the distant stations. It is particularly recommended for use in addition to one or more stages of previous audio-frequency amplification. A-1 is of heavy metal attractively enameled and crystallized. Binding post terminals are provided by a bakelite panel on the back. Any type of vacuum tube may be used.

From the great volume of orders the Magnavox Company is receiving from the trade for these new models it is obvious that the models described above meet a very important need in the radio world.

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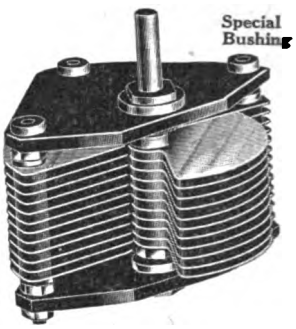

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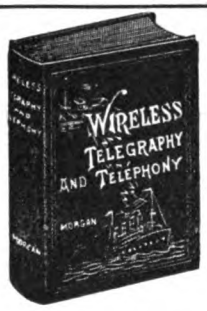

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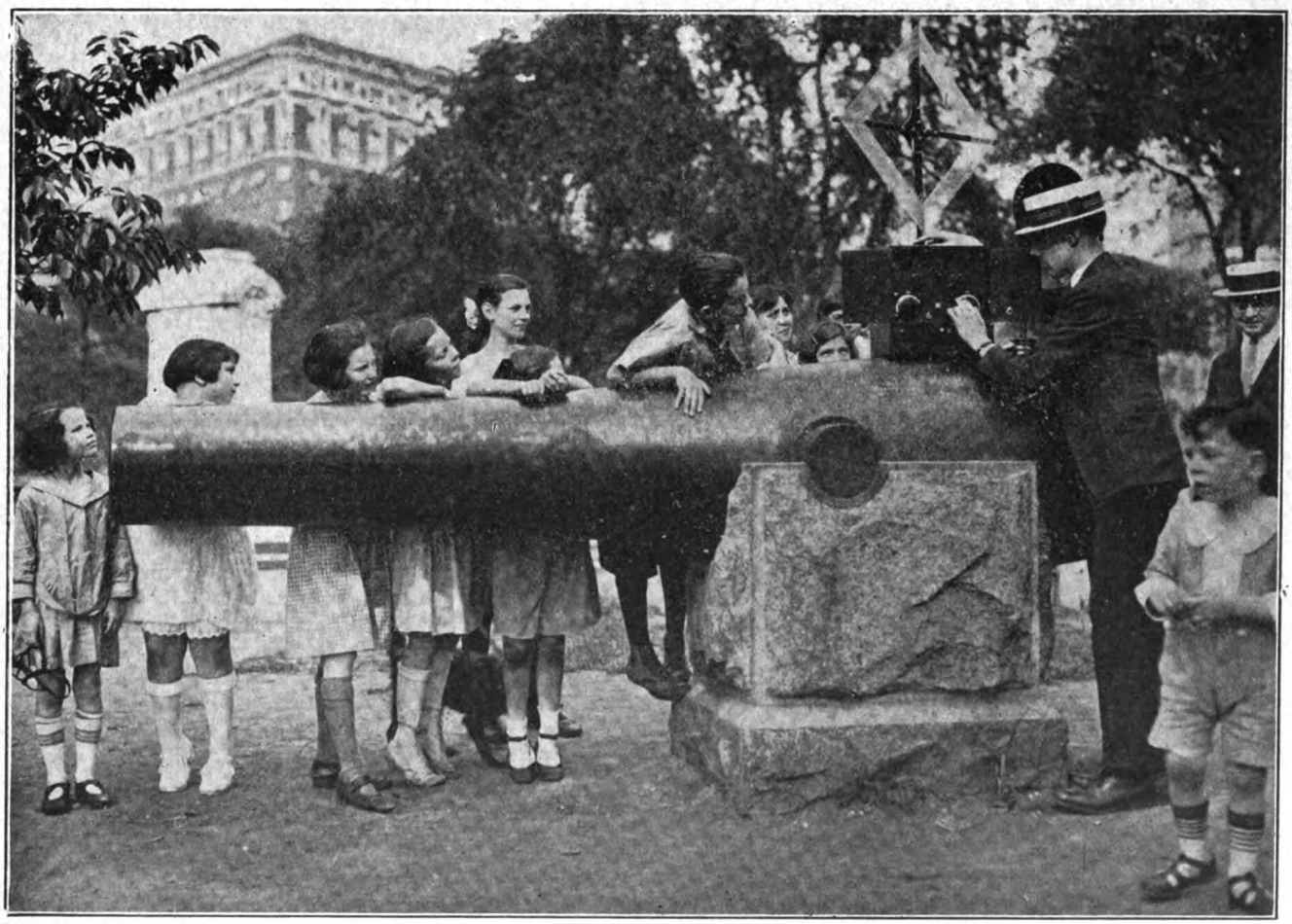

(C. Kadel and Herbert)

Richard Bourne, New York amateur who is a skeptic, is here seen observing the effect of a large steel mass on radio signals and tuning. He found out that the signal strength remained practically the same, but that the directional effects of the loop were seriously harmed, and in most cases the loop was entirely non-directional. All positions were tried out, both on top and under the cannon, which happened to be the largest mass of solid steel in the vicinity. One would naturally expect that the presence of such a large mass of metal would tend to absorb a great amount of the radio waves in its immediate vicinity, but such was not the case. Probably the fact that it was partially insulated by resting on a granite base had a lot to do with it.

NEWSDEALERS, READ PAGE 22!

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

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Vol. III, No. 24. Whole No. 76 September 8, 1923 15c. per copy, $6.00 a year

The Design of Very Compact Sets

By Kenneth Malcolm, A. I. R. E

IT seems that radio fans like to experiment with odd and bizarre contraptions more than any other group of human beings in the world. They develop and construct some of the most unique looking sets and work with the strangest hook-ups. It is a wonder they have such success as they many times do. The craze now foremost seems to be the building of very small and compact outfits, such as can be put in cigar boxes and the like. Leaving out the very tiny untuned sets, some of the very small ones do remarkable work, though it could not be expected that no efficiency would be lost in reducing the size so materially. The main trouble, when these sets do not work as well as they might, is generally due to incorrect design and the use of incorrect hook-ups for a particular group of apparatus. The following paragraphs will attempt to give some data on the fundamental design of these small sets, so that those who are experimentally inclined can go about their construction with the knowledge that the set will work right when it is finished. However, it is only suggestive, aiming to encourage original ideas rather than to array a lot of conventional dogma.

The only small set that is worth bothering with by those who are really serious and who desire consistent results, is one that is tuned, no matter how simple the tuning device may be. A set that can be included in a very small measure is shown in Fig. 1. Either a crystal or a tube may be used as a detector.

In this set the tuning coil is the part that will have to be constructed to suit the individual requirements. Such a coil may be made in one of many forms, as long as the wire takes the form of a coil. Mailing tubes or cardboard containers of all kinds may be used to wind the wire on. After you have selected one of the style you need, it is best to thoroughly impregnate it with some good insulating varnish to stiffen it and at the same time make it waterproof. It is best to have the tube as near round as possible; although square tubes have been used successfully. Next comes the wire. This should be not smaller than No. 26, for past this point the wire has a very high resistance, and sometimes enough to dampen out the waves entirely and thus prevent reception. Enameled wire takes up the least space, although single silk or single cotton covered wire would be better on account of its smaller dielectric constant.

The number of turns you will need depends upon the wave length of the stations you desire to receive, the diameter of the tube, and the length of the aerial you intend to use with the set. It may range anywhere from 20 to 100 turns for short wave reception. However the correct number can easily be found by experiment.

With this type of coil, some sort of slider or tap and switch arrangement is necessary in order to be able to vary the inductance. Of course, it could be fixed and a variable condenser used across it, but this would to a certain extent defeat your purpose of building a very small set.

Where extreme compactness is desired, the spiderweb coil lends itself very readily to adaptation. These coils can be used the same as the cylindrical coils in any of the circuits. A switch and tap arrangement in this case would be more convenient and preferable to a slider.

A way to use two spiderweb coils as a variometer to be used as the sole tuning unit is shown in Fig. 2. Here, both coils are wound with the same number of

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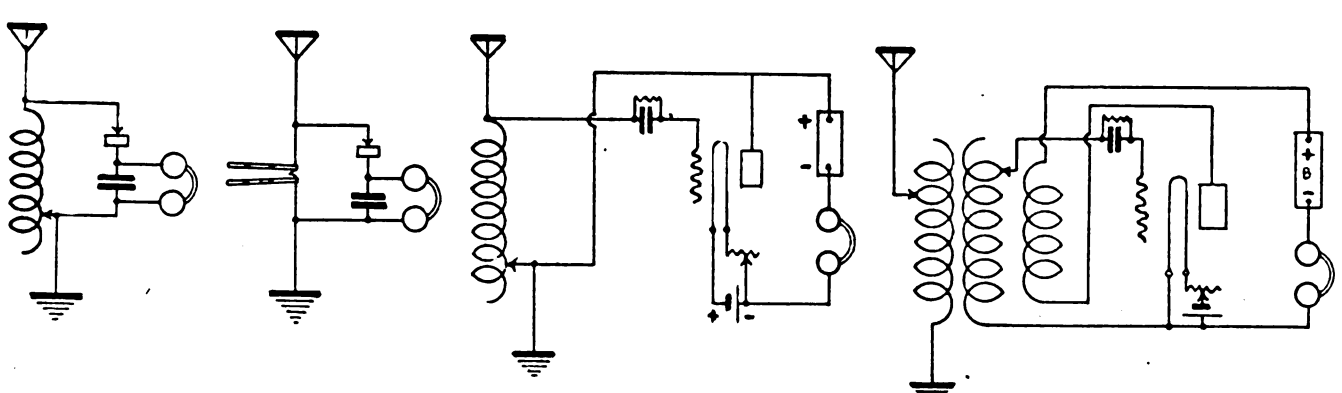

Four simple circuit diagrams particularly adapted to extremely small sets. The first two are crystal receivers and the last two are small tube receivers. The first is a single slide tuner, the second a spiderweb variocoupler, the third an ultra-audion single tube circuit, and the fourth a three-circuit regenerative.

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Impressive Harding Memorial Services Broadcast from Station WJAZ

By R. H. G. Mathews

THE story of the first attempt of a broadcasting station to visualize by means of music and the spoken word a current event of large significance —in this case the final tribute paid President Harding in the city of Washington—doubtless will be a source of intense interest to thousands of broadcast listeners.

The unseen audience of WJAZ—the Zenith-Edgewater Beach Hotel Broadcasting Station at Chicago—were carried in the imagination to the starting point of the funeral cortege and accompanied the sorrowful procession step by step up Pennsylvania Avenue, now to the tune of "Abide with Me," again to children's voices singing "Nearer My God to Thee," again to the inspiring strains of "Onward Christian Soldiers," the impressive Chopin's Funeral March, President Harding's favorite, "Lead Kindly Light," and so on up the wide stairs of the Capitol building. Then as strong male voices sang "Lead Kindly Light," the coffin mantled in the flag was placed on the catafalque in the rotunda. The brief and impressive funeral services followed and were concluded by the sounding of taps.

When the procession got under way the bells of St. John's Episcopal Church began to toll "Nearer My God to Thee" and continued until Reverend J. Freeman Anderson's voice was lifted in prayer. "Nearer My God to Thee," played by the church chimes fell on the ears of the mourners loud and clear at first, fainter and fainter as the procession neared the Capitol—the key-note, as it were, of the pathethic spectacle.

All this passed before the mental vision of the listeners with the aid of word pictures painted by N. A. Fegen at Station WJAZ, the program spoken by E. F. McDonald, Jr., and Dr. Anderson's invocation read by Mr. Fegen.

WJAZ has been submerged since with letters of praise for the effectiveness and sincerity with which the event was handled. To some of the listeners it was so realistic as to provoke tears.

Plate Batteries

IN nine cases out of ten half the troubles brought to my notice are caused by faulty plate batteries, half of which were cheap when they were bought and the other half were bought so long ago that they were long past their useful life," is the remark of a dealer who has been making an investigation of the troubles surrounding receivers. This is a true statement and one that is not regarded as serious by the average fan who has entered the field during the past year or two.

In the matter of constructing plate batteries the principle is fine. But stop to consider for a moment that over nine-tenths of those that attempt this branch of the work do it mainly from the experiences related by another. It takes real experience to make storage batteries, and even greater care to make those for the plate circuit. Unless you understand what to do and how to do it, the cheapest way is to buy a good standard B battery—with the shelf life and the date marked on it plainly!

(*Concluded from preceding page*)

turns, and fastened together at one side by a hinge made of some flexible insulating material. In this case no taps or slider are needed, the tuning being done by changing the relationship between the coils.

That mutual inductance idea suggests another tuning method—that of varying the distance between the individual turns in a coil. The idea is used quite successfully on a little receiving set which is on the market, and which is no larger than an ordinary pocketbook. In this set about 30 turns of wire (the turns each being about 2″ in diameter) are grouped together in a bunch. The only support they have is afforded by a little strip of tape which binds one side and fastens it to the base of the set. By spreading apart the turns on the free side, the inductance is decreased and hence the wave length. Another way to use the same principle would be to make a coil of some good springy wire, fasten one end and draw out or let in the other end, accordion fashion.

A very good hook-up for use with a tube in connection with a midget set is the ultraudion shown, in a simplified form, in Fig. 3. If the tuner is capable of fine tuning, this set will regenerate very nicely. Where a short wave length range is all that is needed, the variometer idea in Fig. 2 would do fine. A tuner with a slider would do quite well, but it would be best to use a vernier condenser across it to tune in between the turns. A single spiderweb coil with one of those new thin variable condensers would allow the building of a set of this type that would be extremely compact. A variable grid leak would help.

The hook-up shown in Fig. 4 is a standard one, and would be excellent for our work if spiderweb coil were used for the inductances. A mounting should be arranged somewhat similar to the three-coil honeycomb mountings, so that the primary and the tickler coil can be adjusted in their relationship to the secondary.

The primary tuning need not be critical and taps may be taken off to switch points at every few turns. The secondary needs a much finer adjustment, and a switching arrangement must be provided that will cut in single turns, or else a vernier condenser must be used across it. The tickler coil should have about a third more turns on it than the secondary.

Most any tubes may be used for these sets, but the dry cell tubes are the most sensible to carry out your purpose more fully. The WD11, WD12 and the UV199 lend themselves admirably, the latter tube, especially, because flashlight cells can be used to light the filament.

Whatever way you build your set, remember that the same principles apply. A tuning coil is the same whether it is wound around the end of a cane, around the crown of a hat, or around one of the more conventional tubes. The writer has constructed a number of these radio freaks and they worked very well, everything taken into consideration. However, there is something very important that must not be overlooked, and that is the joy that was derived from conceiving, designing, and constructing them.

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The Practical Side of Vacuum Tubes

By C. White, Consulting Engineer

ANY one who attempts to cover all about vacuum tubes in one article would indeed be rather crazy. There are at present, in many technical libraries, great numbers of books more or less directly connected with the theory and operation of vacuum tubes of some kind or other. Hence what I shall say in this brief article should only be considered a mere drop in the bucket in the largest possible terms. Over a year ago I wrote a brief history of the vacuum tube, but in this article I shall deal with the practical side of its theory and operation. We all are quite familiar

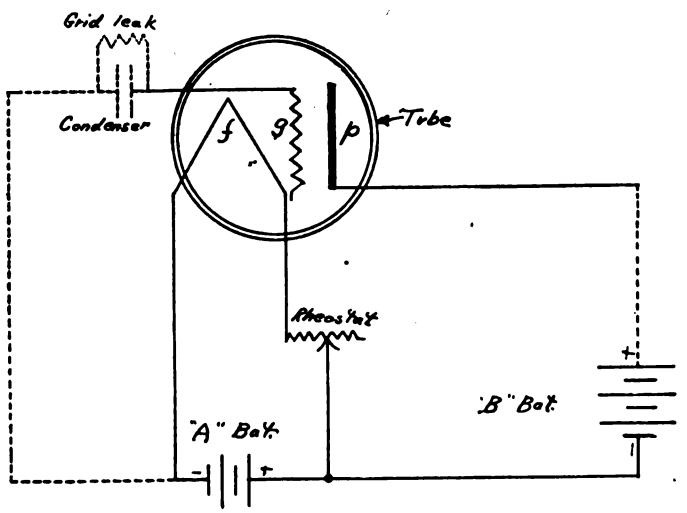

Fig. 1. General schematic representation of a vacuum tube showing the elements and connections.

with the theory apparent when a pot of water boils over a fire. The water sends off into the surrounding adjacent space water vapor or steam.

Exactly the same thing, or the analogous thing, exists when we pass a current through a filament. The current causes the filament to be heated up in the same manner as the fire under the pot, and as a result of this heating electrons are given off instead of steam. We can readily see steam vapor, although steam itself is invisible, but there is no actual form the electrons can take to show us that they are there. The amount of steam that will be generated will depend upon the rate at which heat energy is supplied to the pot and the pressure of the surrounding atmosphere. The analogy is exact with a lighted filament; therefore, to get the best emission of these invisible particles carrying electrical charge it is necessary to remove the air surrounding the filament, hence the use of a vacuum of either high or low amount of evacuation. It is of interest to know that these electrons carry negative charges of electricity. The actual theory behind this statement is rather long and involved in its proof and discussion, and it is well enough to accept it on faith since it has been definitely proven by renowned scientists.

Keeping in mind the case of a kettle of water over an open fire, let us continue an analysis of the vacuum tube action. The "A" battery supplies the energy to heat up the filament which, when the correct temperature is reached, emits an invisible electron vapor in the same way as a kettle emits steam vapor. Now if we should cover the kettle with a lid and have a suction pump so connected to the lid as to draw off the steam vapor at a certain rate then we will have the same action as the positive charge on the plate performs. The positive charge on the plate of the vacuum tube acts as a magnet to the negatively charged electrons which "boil off" the filament.

In other words, the plate gives directional motion to the electrons which would otherwise be more or less stationary. On moving from the filament, where they are generated to the plate, it is necessary for the electrons to pass through a sieve-like structure known as the grid. It is plain to see that this grid structure can be made to accelerate or retard the motion of the electrons on their way to the plate, much in the same way as a valve in a water main can accelerate or retard the flow of water, depending on how far it is open. Electrically, the grid performs this action by taking on a positive or negative charge. When a positive charge is on the grid the magnetic attraction in the direction of the plate is greater and when a negative charge is on the plate the magnetic attraction is decreased. The old rule obtains—like charges repel and unlike charges attract. The total amount of electrons generated will depend upon the heat of the filament, the material of the filament, the amount of vacuum, the amount of positive charge on the plate and the action of the grid. Of course, there is a definite limit, which is the determining limit in tube design.

Vacuum tubes are listed according to kind of fila-

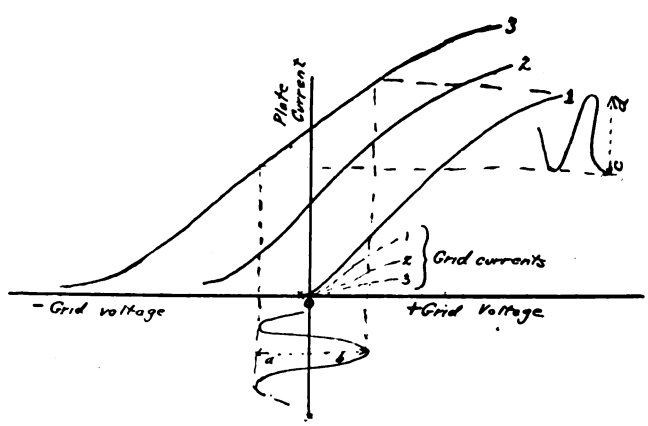

Fig. 2. Characteristic curve of a receiving tube showing the relation of the grid voltage and the plate current.

ment, amount of vacuum, and the power generated. The kinds of filaments now on the market are the oxide coated filament, the pure tungsten filament, and the thorium coated tungsten filament. The Western Electric tubes known as the VT-1 or J tube and the VT-2 or 216 A tube are excellent examples of a filament coated with an oxide which has a property of giving off a high amount of electrons at a low operating temperature, hence giving a long life. The pure tungsten filament is more common and the UV200 or C300 are examples.

This type of filament operates at a high temperature and care must be exercised to see that it is not exceeded or its life will be greatly shortened. The new thorium coated filaments, as the UV199 and the UV201A, operate at a much lower temperature than the pure tungsten filament, hence giving long tube life. The terms hard and soft are general terms relating to the relative amount of evacuation. A hard tube is one

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"Standing By" For News That Shocked the Continent

ANOTHER instance of radio serving as an almost instantaneous means of advising of President Harding's death is recounted by an official of the Department of Commerce who was touring in upper New York on August 6.

Following a cordial reception at the farm of W. E. Carpenter, a vineyardist living near Burdette, N. Y., who had not heard anything over a radio set, the government official set up his three-tube, portable set and tuned in on Schenectady. Neighbors began to gather round the loud speaker. The concert ceased at 9:30 and the operator tuned in WDAP, the Chicago Board of Trade, which was broadcasting musical selections. Suddenly, a vocal selection was interrupted by a message to stand by for an important announcement. The farmers and their families, now numbering over a hundred, not more than one of whom had heard a radio message before, stood in suppressed excitement. The station then announced the reported death of President Harding and explained that it was being verified. This was accomplished at 10:53 Eastern time, and the country people in the neighborhood were thus advised of the national calamity eight minutes after the official announcement was made in San Francisco. It proved a tragic introduction to radio for these novices. Later other stations broadcasting the sad tidings were also picked up as the message sped on its way eastward over press wires.

The midshipmen of the navy cruising in Europe were drawn up on deck for a local ceremony where a radio dispatch to the Admiral of the Fleet advising of the death of their Commander-in-Chief was read. Immediately the ceremony was cancelled and flags half-masted.

Radio, it would seem, did more than any other method of communication to speed the tragic announcement around the world.

New Out-door Radio Sport at Chicago Ham Convention

CHICAGO, ILL.—A new sport involving a unique principle of radio will be introduced for the first time at the Second National American Radio Relay League Convention, which is to be held here September 12-15 under the auspices of the Chicago Radio Traffic Association with headquarters at 959 Rookery Building, Chicago.

Several hundred tiny loop receiving sets are to be loaned by the Drake Hotel to delegates and will be used by them to locate a "hidden" transmitting station. The method used in finding the position of an unknown station is somewhat similar to that employed by navy shore stations in determining the location of ships.

A vessel coming into port may have lost its bearings and the captain, who has been unable to make observations on account of fog, or a cloudy sky, will instruct his radio operator to advise shore stations of this condition, and the latter make "cross bearings" by means of loop receivers, discover the exact location and report it.

Usually when two shore stations work together and advise each other of their observations by land wire, the exact position can be found in a few minutes, but when only one loop set is used and this by someone on foot in the midst of city traffic, the problem is more difficult and requires real skill.

The operator must turn the loop antenna in such a direction that he can tune the transmitter in or out by a slight variation of the finder. After noting the place where this observation was taken he moves several blocks to the right or left and again tunes in his loop receiver as before.

He then draws an imaginary line from both points in the general direction of the "hidden" station and proceeds toward the place where they join together. Frequently this whole operation has to be repeated many times.

(*Concluded from preceding page*)

that has been almost completely drained of gas, such as the UV201A, and a soft tube is one that has a little gas remaining, such as the UV200. Of course, there are many tubes that lie between the two limits which we might call medium. The size and spacing of the elements largely determine the amount of power the tube can generate, but for reception the non-power tubes are employed. For power amplification and transmission larger tubes, which can handle the required amount of power, are used.

In Fig. 1 is illustrated the general schematic representation of a vacuum tube. The grid is represented by the letter g, the filament by f, and the plate by the letter p. The dotted lines replace the coils and other working apparatus of a radio outfit since we are here concerned only about the tube and the batteries necessary to operate it. In Fig. 2 is shown the characteristic of the tube. It is a plot of the performance of a given vacuum tube showing the relation of the grid voltage and the plate current. In other words it shows the existing relation between the two. The solid curves marked 1, 2, 3 are drawn for three separate plate or "B" battery voltages. The curve with the highest number indicates the relation with the highest "B" battery voltage on the plate. The small dotted line curves marked similarly represent the amount of current relatively flowing in the grid circuit for the given plate voltage. Please note that the higher the plate voltage the less the current flowing in the grid circuit.

If we should desire a given tube to act as a detector of radio signals the tube should operate with a plate voltage which will allow it to work as outlined by curve 1. It is plainly observed that this curve ends at the point marked x and you will note that when the grid voltage is negative there is no plate current; therefore, only the positive grid variations will appear in the plate circuit current. This means that the signal is rectified or detected. In order to properly regulate the grid current that flows at the lower plate voltage, such as used with the tube as a detector, a grid leak and leak condenser is employed. If the tube is to be used as an amplifier it is important that the negative as well as the positive variations of the grid voltage should be passed along to the plate circuit amplifier. Hence we must work on characteristics 2 or 3 since 1 only passes on positive grid variations. Assuming we work with plate voltage 3, then, for example, the grid variation a-b will appear as the current variation c-d in the plate circuit.

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Blind Police Hero Builds His Own Set

THE fact that radio brings contentment is a proven and established fact. Many helpless humans who cannot stir are kept happy by their radio sets.

One case of note is that of Patrick O'Keefe, blind hero of the New York Police Department. He lost his sight in the performance of his duty by a pistol bullet. For many months, handicapped as he was, he was extremely unhappy. Naturally a very active man he could not accommodate himself to enforced idleness. Being, however, of a mechanical turn of mind, he thought of radio, and with the help of a friend built a crystal radio set.

(C. Keystone Views)
Patrick O'Keefe listening in on his receiving set.

Now, though unseen and unseeing he is the guest of many an important dinner and reception that is broadcast, where the microphone acts as his "eyes." He chuckles heartily at the jokes, enjoys the music and through his mind's eye, though really in his arm chair, he is sitting right next to the toastmaster, or has a table next to the orchestra that is playing. He even "sees" all the popular plays that are broadcast. It is said that blindness sharpens man's perception and imagination, and therefore he can readly have a ringside seat at all the fights, with all the comforts of his home and easy chair besides.

Radio has probably done more to alleviate the suffering of the afflicted than any agency human or otherwise. It brings contentment to those that are used to action, by keeping their minds active and away from their trouble, which doctors tell us helps more than medicine. To substantiate this fact, for it really is a fact, think of the number of hospitals that have called radio to the fore in cases where the brooding of the patient would seriously deter his cure or treatment. And for a man that has been active, as Patrick O'Keefe surely must have been, the loss of his sight is really something to brood over, brave as he may be. But radio does not give him the chance, for you cannot "listen in" and think of other things.

"Big Bill" Edwards Radios Address on Boy Scouts

BIG BILL" EDWARDS, former Collector of the Port of New York and well-known former athlete, recently gave a talk from Station WEAF on the subject of Boy Scouts. "Big Bill," who is a lover of the great outdoors and an ardent supporter of the Boy Scout movement, spoke for the Boy Scouts Foundation of Greater New York.

Many listened with interest to the talk, especially the Boy Scouts in camp, and those having radio sets were sure to be popular when "Big Bill" made his address. The Honor Scouts who were allowed to be present at the studio at the time the address was made were highly impressed with the entire proceedings, especially as they were the only people allowed in the studio at the time the address was made.

The illustration shows "Big Bill" Edwards making his address attended by the Honor Scouts. During his long political career "Big Bill" never talked to as large or attentive an audience as on this occasion.

(C. Photonews)
"Big Bill" Edwards attended by Boy Scout Honor Squad.

Amateurs Pick Up MacMillan Message

JAMES A. TRAINOR, of Dorchester, Mass., and R. B. Bourne, of Chatham, Mass., both radio amateurs, on August 29 picked up a radio message from Captain MacMillan's Arctic ship "Bowdoin." The news sent out by Operator Mix, of the "Bowdoin," was "Located latitude 78° 30'," and was the first word received by the world from the explorers in 32 days.

This would locate the expedition on the northwest coast of Greenland, about 2,400 miles north of where the message was received and within the auroral band.

After proper verification, it would seem that one or both of the amateurs named will be entitled to the receiving set offered as a prize to the first amateur to deliver the next message from Captain MacMillan to the Zenith Edgewater Beach Hotel Broadcasting Station, Chicago, announced in last week's RADIO WORLD.

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France and America Standardizing Waves

By Carl H. Butman

WASHINGTON, D. C.—In an effort to standardize radio frequencies used in trans-Atlantic communication, the Navy Department is co-operating with the French Government and once a month the frequencies of the Annapolis and Lafayette radio stations are recorded and compared. Transmission on standard frequencies, or wave lengths, is essential to efficient communication in order that all stations can keep to the wave lengths assigned them by national or international law. Special efforts are now being made by the United States and foreign governments to keep all their stations on the prescribed waves and it is essential that their standards be equivalent and their instruments be calibrated.

Every month special signals are transmitted from Lafayette and Annapolis on known frequencies between 16 and 17 kilocycles. These signals are observed simultaneously at the Naval Radio Research Laboratory at Bellevue, D. C., and at the French Military Radio Telegraph Laboratory at Paris. The stations are advised by radio and also by mail of the exact frequency measured on receipt and thus the check is made. If an error of more than one-tenth of one per cent. is found, further tests are made and the apparatus for measuring frequencies at both stations is also calibrated. Eventually, perhaps within a year, it is hoped by naval radio experts that the error can be reduced to one-hundredth of one per cent., but at present they are satisfied with an error of less than one-tenth of one per cent.

The basic measure of radio-frequency is a standard tuning fork and upon this is calibrated a multi-vibrator on which a mere beat can be measured. Wave meters are checked against the multi-vibrator and are used in measuring the frequencies of waves used in commercial and official communications.

The frequencies of the naval radio stations at San Francisco and Annapolis are also compared periodically by the laboratories at Bellevue and Mare Island, so that the naval standard frequency measure is kept constant throughout the United States. Eventually the Bureau of Standards will test the waves assigned to stations and calibrate their instruments. The work of the Navy Department is carried on primarily for the efficiency of its own communication service. As there are hundreds of naval ships and a large number of shore stations, each operating on distinct waves, it is essential that they stick to their allotted frequencies and not interfere with other ships or stations.

When all stations maintain their proper wave lengths or frequencies exactly, tuning in will be more readily accomplished, it is pointed out, the process approaching the simple adjustment of a dial to a known position. Perhaps dials will be marked "London," "Paris," "Berlin."

The Bureau of Standards has already sent out standard waves at known frequencies for the benefit of eastern amateurs and broadcasters, so that these stations can calibrate their instruments and set their transmitters on their proper frequencies. This work shortly will be put into definite practice, it is understood, and the stations which do not keep their proper waves may be closed.

Cavalry to Have Portable Radio Sets

A REPORT on the requirements of radio equipment for the cavalry has just been completed by a board of cavalry and signal corps officers which met recently at Fort Bliss, Texas. While the recommendations of the board have not yet been made public, it is known that they contain considerable data as to improvements on existing radio sets together with suggestions for the signal corps in designing new apparatus for the use of cavalry in the field.

Both cavalry squadrons and regiments are now equipped with pack radio telegraph sets knowns as SCR-127, a tube set capable of transmitting about 60 miles. The apparatus, which weighs 200 pounds, is split up when transported between three horses or mules, one pack comprising the generator, another the batteries and aerial and the third the set itself with spares and auxiliary equipment. Brigade headquarter troops are outfitted with more powerful sets, designated as the SCR-130, and having a slightly longer range. This set is now transported on a wagon.

Recommendations of the special board include methods of transportation, whether horse pack, wagon or motorized; power plant, extent of wave band, range, weight, and other specifications for the new issue of radio equipment for cavalry. It is believed that motor equipment for the larger units such as brigades will be recommended, and that the range of the sets will be extended to over 60 miles. Radio telephone equipment will not be assigned, since these sets are of greater weight than it is practical for field transportation and radio telegraph seems to serve the needs of the cavalry. The signal corps is understood to be awaiting the report of the board before undertaking improvements on old sets or developing new equipment.

NC-4 Had First Radio Aircraft Compass

THE use of the radio compass on aircraft of the navy dates back to the trans-Atlantic flight of the three NC boats in May, 1919, on which occasion Commander Reed of the NC-4 made a very practical use of his direction-finding instrument.

In taking off from Horta, Azores, to Lisbon, the third leg of the trip, Commander Reed in his report states that a rather hard "porpoise," or bump on the surface of the sea, was made. This caused one of the gimbals of the navigator's compass to jump out, causing an error of 7 to 8 degrees, although it was not known until some time later, he writes. The first destroyer stationed on the route was picked up apparently in its proper place, but it must have been south of its position on a line to Lisbon it was discovered later. The NC-4 passed ten to twelve miles to the south of Destroyer No. 2, only the smoke being sighted, while No. 3 was not seen at all.

Commander Reed here decided he was far to the south of his route and headed north. With the aid of his radio compass he picked up Destroyer No. 4 just off his port bow, and then continued eastward sighting all the remaining destroyers as he proceeded to Lisbon.

If he had not been able to check his position, or locate the fourth destroyer by means of the radio compass, it is possible that he would not have reached Lisbon, and the trans-Atlantic air trip might never have been completed.

To-day, many naval long-range aircraft, including the ZR-1, airship, are fitted out with radio compasses in the interests of safety and so that navigators can check their positions independently of their regular compasses.

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Converting the Spark Coil

By Byrt C. Caldwell

THE spark coil is doomed to die as far as damped wave radio transmission is concerned. The great interference which the spark set causes, and the short distances which it covers, make it unsatisfactory for the up-to-date amateur. The C. W. or I. C. W. set is undoubtedly ideal. When handled with reasonable care, this causes no interference to the broadcast listener, and with the same amount of power has a reliable range of at least fifty times the distance of the spark. Interference among the amateurs themselves is also reduced to a minimum, as the emitted wave is extremely sharp.

I will not go into the details of the reasons why the undamped wave set has such a high efficiency when compared to the damped wave set, as this has been explained

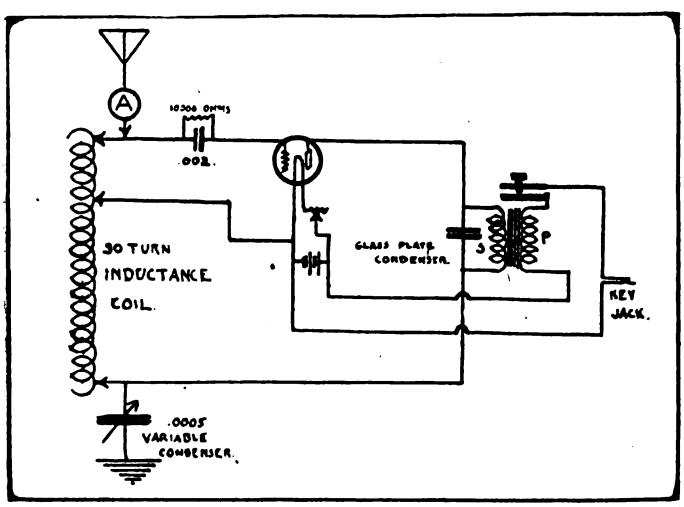

Fig. 1. Circuit diagram illustrating the use of a spark coil for CW transmitting. Extremely simple and efficient, and, if well tuned, is capable of much longer distances than could be obtained by the spark coil alone.

dozens of times in magazines and books which anybody may easily obtain.

If you have a spark coil set at the present time and, at a cost of several dollars, wish to change it into a set which has a range of several hundred instead of several miles, and which causes a minimum of interference, you would do well to construct the set described below.

It is very simple and is as easy to build as a regenerative receiving set. In the diagram, the full lines show the layout of the front of the panel and the dotted lines show the arrangement of the instruments at the rear of the panel. This panel layout should be followed carefully, as it is planned for the shortest possible leads and for maximum efficiency. The hot wire ammeter is in the upper left hand corner of the 7" x 12" panel. This, while not absolutely necessary, should be used if you wish to get the best that is in the set. A miniature tungsten lamp may be used instead. When tuning, adjust the set until the lamp lights the brightest. The variable condenser, which has a capacity of .0005 mfds., is in the upper right hand corner of the panel. This condenser should preferably be of the two-plate mica dielectric type. The rheostat is mounted in the center of the panel and the binding posts for the coil and filament are directly underneath this. The antenna and ground binding posts are both at the top of the panel and the jack for the key is on the right side of the panel. The instruments are arranged as follows: The spark coil is on the right hand side of the panel and the glass plate condenser is to the left of this. The tube is directly in back of the rheostat and the inductance is behind the ammeter and the tube. This is supported by brass strips fastened to the edges of the coil and the base.

The spark coil may be a ½" to 1" instrument. If a coil which has only three terminals is used a separate battery must be used. The glass plate condenser is necessary to reduce the secondary voltage of the coil to a value where it will not damage the tube. A fairly large condenser will be necessary for this purpose. The size will vary, according to the coil used, and the voltage requirement of the tube. The larger the spark coil, and the lower the voltage required by the tube, the larger the condenser will have to be. One for use with a 1" coil and a five watt tube can be made by separating about 25 4" x 6" sheets of tinfoil with 5" x 7" photographic plates. These can probably be obtained for nothing from your photographer, as the manufacturing companies are not buying them back at the present time. Be sure to clean the plates absolutely free of the last trace of emulsion. The tube should be a five watt transmitting tube, although a hard receiving tube, such as the UV201A will give good results up to a distance of 100 miles or more. With this tube the condenser across the secondary of the coil must be larger than specified above. The inductance consists of 30 turns of bare No. 12 or No. 14 copper wire, stranded preferred. It is wound on a form made of bakelite or hard rubber strips, either cylindrical or square in shape, and about 4" in diameter and 6" long. Fasten the wires securely by running the ends through holes drilled in the form. Do not use shellac. The bare wire, and the frame instead of a solid bakelite form, are used so that air is employed wherever possible as an insulator. Lugs are soldered to each turn of the inductance, so that the set may be tuned by varying the number of turns used. The grid leak should have a 10,000

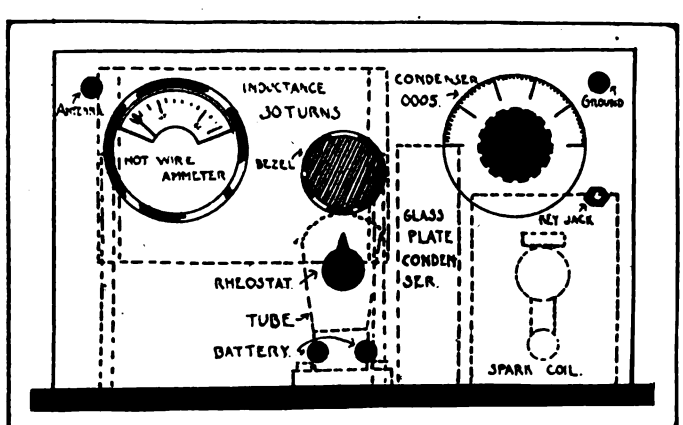

Fig. 2. Suggested panel and instrument layout for the spark coil transmitter.

ohm resistance. The grid condenser may have a capacity of about .002 mfds. The condenser in the ground lead should have a capacity of .0005 or .001 mfds., and should have a mica dielectric.

The hook-up shown is one of the simplest and most satisfactory. This set gives a tone which may be varied by means of the vibrator of the coil. The connections from the secondard of the coil should be reversed and left at the connection which gives the greatest antenna current. In wiring the set, use bus wire, and solder every connection. This is especially important. You will never get results with loose connections and poor wiring. Bare wire should be used, except where two wires cross very close to each

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A Reader Objects to Antenna Figures

EDITOR, RADIO WORLD:

I have just been reading your article called "Properly Installed Antenna Greatly Aids Better Reception" (RADIO WORLD, August 25, 1923) in which you state that a height of 40 feet and a length of not more than 75 feet for a receiving antenna has been found most suitable for good reception.

According to my personal experience, I think these statements are absolutely wrong when made without qualifications. With a three-tube regenerative receiver, which I use, an antenna 250 feet long gives far superior results to an antenna of half the length. An antenna 80 feet high gives results far superior to those obtained with an antenna 40 feet high. These are results of actual experience.

I am now using at the Eastern Yacht Club, Marblehead, a single wire antenna, which with the lead-in, measures 250 feet and I am getting very satisfactory results on all wave lengths from the shortest broadcasting station upward to 20,000 meters. Signals come in very clearly and satisfactorily.

In your article you state why the height should be limited to 40 feet but you do not state why the length should be limited to 75 feet.

In my opinion such unqualified statements do great harm. An antenna which will work with one receiving set satisfactorily may not work with another receiving set satisfactorily. This important statement you have left out of your article entirely.

I have in my room beside the regenerative receiver a four-tube crystal detector reflex receiver which connected to the long antenna above referred to brings in ship signals of great clearness and distinctness. These I suppose are on 600 metres but ordinarily it will not bring in broadcast stations at all.

To get broadcast stations with this reflex receiver, I use a wire strung around my room on the floor simply fastened to the corners. This wire is about 45 feet long and brings in Chicago stations, even in summer weather, more than loud enough for a loud speaker.

I have in my home in Concord a cage antenna which I use for receiving which is 4 feet in diameter and composed of eight wires 100 feet long with a single 7-20 lead-in. My idea in building this form antenna was for its ultimate use for transmission but it is too long for 200 metre work and I do not care to cut it down because I get such marvellous results with it in receiving all wave lengths from 150 metres to the highest used in transatlantic work. This antenna is 80 feet high.

At my summer home at Seal Harbor, Maine, I had a long single wire antenna, probably 250 feet, on which I got Cuba in July on a three-tube regenerative receiver, using only two tubes and also using coils 25-35-50. I could get the shortest amateur stations much better than on a short 100 foot single antenna which I put up especially for short wave lengths. So far I have found with this regenerative receiver the longer and the higher the antenna, the better the reception.

I find that in almost everything connected with radio, positive statements such as you made in your article on antennae are always wrong. Yours very truly,

W. K. SHAW.

160 State Street, Boston, Mass.

New Class A Stations

Two limited commercial or broadcasting stations were licensed during the past week by the Department of Commerce:

Call	Station	Class	Frequency Kcys.	Wave Length Meters	Power Watts
KFJR	Dixon, Ashley C. & Son, Stevensville, Mont.....	A	1160	258	50
WTAJ	Radio Shop, The, Portland, Maine	A	1270	236	50

Distance

MANY fans who do not really understand radio always want to know "the distance my set will receive." This is impossible to predict, as there are entirely too many variable features which bear on the subject. If a salesman tells you that the set he tries to sell you will receive 2,000 miles take it with a large amount of salt and tell him that you know he is "stringing you along." It is impossible to even fairly guess at the distance a receiver will function. Also do not expect to pick up more than one-third the distance in the summer time that you received in the winter. Be satisfied with local stations.

Too Much Is Bad

MANY amateur builders, when constructing sets, have a very bad habit of using too much soldering flux when making connections. Do not use too much, as it will spread and cause leakage. A little (very little) goes a long distance when the iron is properly tinned and hot.

(*Concluded from preceding page*)

other, when a piece of insulating tubing should be slipped over one of the wires.

A word about the antenna system. A great deal more care is required in the construction of a sending antenna and ground system than is necessary for an antenna and ground which is to be used for receiving only. The best type of aerial is the cage type. About eight wires, 80′ long, soldered to metal hoops about 3′ in diameter and with a cage lead-in which tapers sharply, so that the point is at the lead-in insulator, will make the most efficient sending antenna that you can erect. Keep it as far away from trees and other objects as possible, as all these things absorb some of the energy. If possible, use a counterpoise ground. Keep it well insulated from the ground, and have it extend a few feet on all sides of the antenna, directly underneath. If it is impossible for you to have a counterpoise, use buried copper plates or chicken wire, placed directly beneath the center of the antenna. If the counterpoise is used, have it perfectly horizontal, because if one portion is higher than the rest, the resistance is increased.

With this set an antenna current of one ampere is easily obtained, if a power tube and a good antenna system are used. The reliable range of the set is several hundred miles, and under very good conditions distances of 1,000 miles or more are often reached.

This set, if adopted by all the spark coil "brass pounders," would cause a tremendous reduction of QRM amongst the amateurs, as well as a reduction of interference experienced by broadcast listeners.

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Closes Big Radio Deal

(C. Kadel & Herbert)

Scene at the Metropolitan Trust Co., New York City, when the syndicate headed by Edward H. Jewett, of Detroit, took control of DeForest Radio Telegraph and Telephone Co., of Jersey City, N. J., by purchase of the personal stock in the company held by Dr. Lee DeForest, radio pioneer.

At times people talk of the warfare between science and religion, but a minister in the Middle West has said: "Religion that is killed by gasoline or radio never was alive."

* * *

In order to protect workers from accidents and eye sight damages, no less than five states—New York, New Jersey, Pennsylvania, Wisconsin and Oregon—have now in force lighting codes for industrial establishments. Other states are now considering the adoption of similar codes, and it seems only a question of time when all the states will adopt such a code.

Owen D. Young, president of the General Electric Company of Schenectady, N. Y., who recently returned from abroad, visited Washington last week and gave to President Coolidge his views on conditions in Europe.

* * *

Radio enthusiasts will be particularly interested in "Zeno," which opened at the Forty-eighth Street Theatre, New York City, last Saturday night, because radio is used not only to create many of the spiritualistic illusions with which this new thriller abounds, but is also employed by the criminals in eluding the police and finally by the police themselves in capturing the gang and clearing up the mystery.

* * *

Radio will play a large part in the next Presidential campaign in Mexico. Two leading newspapers—one morning and one afternoon—have opened broadcasting stations, which are giving concerts three nights a week. Politicians are studying a plan to use these stations to broadcast the ideas of candidates. Mexico City alone has 600 receiving sets, with many more in the suburbs. Other large cities, such as Guadalajara, Monterey and Puebla, have scores of radio fans.

* * *

Dr. Charles P. Steinmetz, the electrical wizard of Schenectady, N. Y., has been indulging again in prophesy. He predicts that in another 100 years electricity will do most of our work, so that no one will have to labor over four hours a day. This would leave lots of time for "voluntary agriculture" and many forms of self-improvement and leisure. All of which leads Heywood Broun to observe in his column in the New York World: "In spite of the lack of leisure in the land, most lives are organized for sporadic expeditions to kill time. We mangle hours and whip seconds through a slaughter-house. Treat time kindly and it will do as much for you. Pat it on the head and it will arch its back and stretch. In fact, anything which can be done to keep time alive renders it a far more pleasing playmate than do all the various devices by which it may be slain."

Making One 22 1-2 Volt B Battery Serve for Detector and Amplifier

By E. C. Mallory

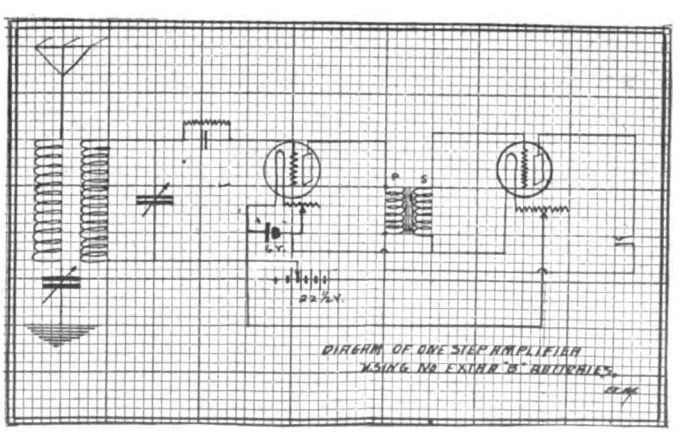
DURING the course of my daily work as radio operator aboard the S. S. "Governor Cobb," I have made a little discovery, which may not be new to some people, but strikes me as being something that I have never heard about before.

On board we use the type 106 B Marconi receiver and also a standard regenerative circuit. During my "fooling" around and changing B batteries, I happened to connect just one 22½ volt B in such a manner that when I looked the second time I saw that it would supply both the detector and amplifier.

In the diagram which I am submitting (detector and one stage non-regenerative) you will notice that there is no 45 volt B amplifier battery. The diagram is the same as the ordinary hook-up, only that the lead which generally goes to the positive of the 45 volt B battery goes back to one side of the primary of the transformer, thus eliminating the B battery.

I have used this hook-up very successfully and have surprised many when I tell them of it. Everybody is trying to figure out just why they did not discover it before, especially when the amplifier B batteries were running low.

One point that I found out that is necessary is that it is sometimes best to reverse the primary leads to the transformer to get the best results. Of course, it should be tried both ways to determine which is the best. The circuit works as well on the non-regenerative as it does on the regenerative, which is saying something. I am giving it to you so that you can tell the fans and maybe help some of them.



Showing how to use one 22½ volt B battery for both detector and amplifier.

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Why I Flunked Three Times in the Radio Code Examination—And Then Passed

By One Who Did

OUT of the tens of thousands of broadcast listeners there is bound to evolve a goodly number of radio amateurs and commercial operators. When once the virus has been absorbed, the attraction of code work is irresistible. The short and long buzzes from the spark and C. W. stations seem to have a sort of romantic allurement that is less apparent in the more common voice transmission. And the joy of personally getting on the ether is far too great for adequate expression.

About five years ago I got the bug that I wanted to become a commercial operator. For a like amount of time before that I had been an amateur, or "ham." As I was self-conscious to a large degree, and furthermore, as I had irregular business hours, I had a sort of aversion to personal instruction; so I did what was the next best thing and took up a correspondence course in the subject. I took the particular course that I did because it was very widely advertised, because it had been established for a number of years, and because the staff of instructors had credentials that indicated them to be capable men. With the course I received several books, some instruction sheets and an omnigraph for learning the code.

Right here let me give my opinion of a correspondence school for learning such a subject as that of radio. In themselves, they are fine institutions (the best of them), but what a person can get out of them depends a great deal upon his own psychological characteristics. A person, in order to get the most out of a home study course, must be a "plugger." He must be perfectly contented to sit alone for long periods and study, and persistently listen to the code buzzes even before they are in any degree intelligible. He must be a person who burns with the desire to learn and not one who must have everything knocked into him with a mallet. If there is that earnest desire that will sustain persistent effort, and if the person is naturally intelligent and responsive to book learning, if his time and money is limited, and if he does not require the personal touch of a teacher, the correspondence method is to be highly recommended. Otherwise, disappointment would be avoided by taking up class work with a real live instructor.

Being very busy with other work at the time I started the course, I had very little time to spend on my studies. Getting home rather late nights, and being tired out, I found it difficult to concentrate to any extent. It required on an average of six readings to thoroughly digest the contents of a single page of the book. But there is one thing that I learned afterward, and that was that the knowledge I gained in this way did not go in one ear and out the other, but stuck fast; and much of it I remember to this day.

Being of a naturally phlegmatic disposition, the code was even harder to master. It simply would not seem to sink in. And it was especially difficult to listen for long periods to the very impersonal omnigraph, which repeated the same old thing over and over. So the result was that I succumbed to procrastination, and many nights I did not listen in at all, but simply did my theory work. Then again, I had the fault of wanting to get ahead too fast, which tempted me to increase the omnigraph speed beyond my capabilities at the time. This trick did nothing but tend to increase my disappointment at not being able to copy, and at the same time retarded my progress.

Later I tried to do some reception over a regular receiving set, with still less success than with the omnigraph, for the reason that most of the stations which I wanted to copy sent too fast, and some others too slow. That is one thing that is soon realized by a code student—that there is a too slow speed as well as one too high. Of the ten word a minute stuff, I could copy about every second letter, of the fifteen word stuff, about every third letter; and of the stuff at twenty words, only about every fourth. Still I persisted in trying to copy these speeds, instead of seven or eight on the omnigraph, which I should have done.

The theory came on pretty well; and to make it more interesting, I accepted a position as instructor in a large Y. M. C. A. radio club. There I had the surprise of my life. Those fellows could ask some of the darndest questions that existed—some that I would never think of in a lifetime. That put me on my mettle, and rather than show my ignorance, I put in some intensive study in a big library. There was nothing in the line of radio that I did not touch on; from the ether and electron theories down to the practical phase of adjusting a catwhisker. The value of this work, which was just to satisfy the "kids," was not realized until later on in my experiences. It did one good thing in that it gave me a very firm foundation for later practical work.

Once more getting the craving to have a radio license, so that I could "shove off" as an operator, I went back to intensive code practice—or, at least, what I called intensive. But, try as I might, it seemed that the harder I worked toward this end, the farther back I slid. One day a friend came to me and asked why I did not attend a certain resident school, as he had made such remarkable progress there. This was a new hope, and I grasped at it eagerly, enrolling for code practice almost immediately.

At this school there were a number of long tables at which the students sat to send and listen in, and at the end of the room was the instructor with his hand sending key, and several automatic sending machines. Under this system I was first advanced to the ten word and then to the twelve word table. But at this point my receiving ability came to a standstill, and occasionally even seemed to drop back a pace or two. I could send fairly well at a twenty word rate, but my receiving was rotten. At about this stage in their learning, the students all seemed to like to waste their time, and cut-up rather than do earnest work. So, for at least a month, I did not visibly advance one particle.

At the end of that time I had another spurt of enthusiasm, and almost overnight I found I could easily copy fifteen words. Then eighteen! This was all too good to last, and I came to another standstill. I could take down twenty or twenty-two words in my mind, but I could not get them on the paper; my hand wouldn't respond quickly enough to the mental impressions that were telegraphed to it.

So at last, giving up the idea of getting a first grade license as hopeless, I made an appointment with the inspector to try for a second grade license. I was confident that I could get this, as the required speed was only supposed to be twelve words a minute. It was only a few days before the examination, so I did a goodly bit of "cramming" both on code and theory.

The eventful day arrived, and shivering, yet perspiring, I found myself sitting by a little desk in the Radio Inspector's office at the Custom House, with pencil in hand, paper before me and a single phone over one ear. Immediately the destroyer, Worry, popped up. "There is so much noise about the room. It's getting cold. You are not used to a single receiver, and therefore you will not be

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able to hear well. The omnigraph that the inspector uses will kick and jump, and you will miss many letters. You can't pass, so what's the use?" All of those things ran through my mind and gave me the cold chills. And it seemed that everyone else about me was in the same mood. There was at least a half hour of suspense before the inspector announced that everything was ready.

Then came the five minutes of torture. First a little squeak as the buzzer was adjusted, then a moment of testing the omnigraph speed, and finally the real sending for the test. The speed was about eighteen words a minute. About five words passed before I was able to make the first stroke with the pencil, then for about eight words I ran along very nicely. But at that moment the omnigraph gave a lurch and rendered a letter indistinguishable. This threw me off my track, and I missed a half dozen of the following words. For the remainder of the five minutes I got about every second word, and a few of the letters in between; but as to pass requires at least sixty consecutive letters in one string, I managed to fail, miserably. The inspector was good enough to give the same test over again for those who failed, but I was so shaky by this time that I flunked once again, and was told that I could come around at the end of a month and try it over.

At the end of the month, I tried again—and flunked flat. At the end of another month I tried again, and again failed. The third month spelled failure for me once again. Then the new law came into existence, that made it necessary for a flunkee to wait three months before being given a chance to try again.

Having all that time on my hands, I started to thinking. Possibly I was following the wrong track. Possibly I was following something that was hopeless. But whatever was the matter, I was determined to find out. And I did! The result was that I passed the test at the next trial, and almost got a first grade license instead of a second. As far as theory was concerned, I lost only three points, and this was taken off in half points at different places for being too brief.

What did I find out? It was simply that I had been wasting my energies trying to fight a something that did not exist. I was fighting against worry, fear, mental sluggishness and lack of concentrative power; when, if I had but known it, they were nothing more than imaginary beings that I had created myself. I learned that all good operators worked subconsciously, rather than consciously, and that though this power was natural in some, it could be acquired by others. I learned that a proper attitude would almost entirely eliminate all the extraneous disturbing factors and render a perfect concentration possible.

The goal I strived for was to make the radio code an integral part of my subconscious mind; so that whenever I put myself in a passive state of mind I could recognize the characters automatically. Then I was to try to gain the subconscious co-ordination between my mind and my hand. A seemingly difficult problem I had before me, but one which appeared simpler later than at first.

As a starter, I learned that by a change in diet I could quicken my speed and decrease a sluggish mental action. So, cutting out all the heavy proteins, such as meat and cheese, I filled up on fresh vegetables, fresh fruit and milk. This diet allowed considerable variety, and I thrived on it—a very noticeable difference in my health taking place within several weeks. Another thing which I cultivated was deep abdominal breathing. Also the habit of drinking two or three quarts of water daily, to keep the system flushed.

Whenever I chose to do my code practicing, I centered my mind about that and nothing else. Everything was done in a calm manner. Sitting down quietly before the set, I picked up the phones, and handled them for a few moments, thinking of nothing in particular. After putting them on my head, the set was slowly tuned until something was heard. The signals were brought in to a medium intensity, and for about five minutes at each period I sat with my mind fixed on this code jargon, but without making any definite effort to distinguish the individual letters. Occasionally it would occur to me that a certain combination represented "the," and another "and," and still another "New York"—the most usual words used. At the end of that period I would begin to copy. If it were at the right speed, I would continue for a time; but if it were too fast I would wait as before, or else try to tune in someone else.

I lived quite near a high-powered station, and I could get signals all over the room with a crystal detector. Occasionally I left the switch on for the night, and the signals would be the last things I would hear before going off to sleep and the first thing upon awaking in the morning, and many times upon awaking in the night I would hear them. This practice, though it may seem silly to the average person, did a lot of good.

Every time I sat down before a set I tried to free myself of all excitement, and obtain a perfect passive attitude. Nothing at all outside was allowed to worry. In a short time, by using this method, I became able to copy almost unconsciously, and instead of letters, words would form themselves. The result was that at the next examination I got my second grade commercial license—and the next examination, a *first*.

Quiet Hours Bring Harmony to Ether Waves

HARTFORD, CONN.—Recent radio regulations are helping to bring harmony into the ether where formerly chaos reigned, and this winter will see, doubtless, a vast improvement in receiving conditions, officers of the American Radio Relay League believe.

This view is based on reports from all of the League's Operating Department divisions, which indicate that the "quiet hours" between 8 and 10:30 P. M. advocated by the Department of Commerce are being observed faithfully.

It should be noted particularly that the department specifies local standard time for amateurs, which means that, if the local community has adopted daylight saving time, the quiet period to be observed is between 9 and 11:30 o'clock. A letter from the Bureau of Navigation comments in part as follows:

"The Bureau expects the amateurs to conscientiously adhere to these regulations * * * and when complaints are received from broadcast listeners that they are experiencing interference from code stations, which they believe to be amateurs, they will be required to furnish the name and address or the radio call letters of the station causing the disturbance.

"Where complaint is made that amateurs are causing interference after 10:30 P. M., local standard time, the parties making such complaints will be informed that the amateurs are required to observe a silent period of two and one-half hours each day to permit uninterrupted reception of the broadcast service, so far as the amateurs are concerned, and that as the amateurs are rapidly replacing their spark sets with tube transmitters and many of them using C.W., it is believed that they are contributing their share in the matter of giving relief from interference."

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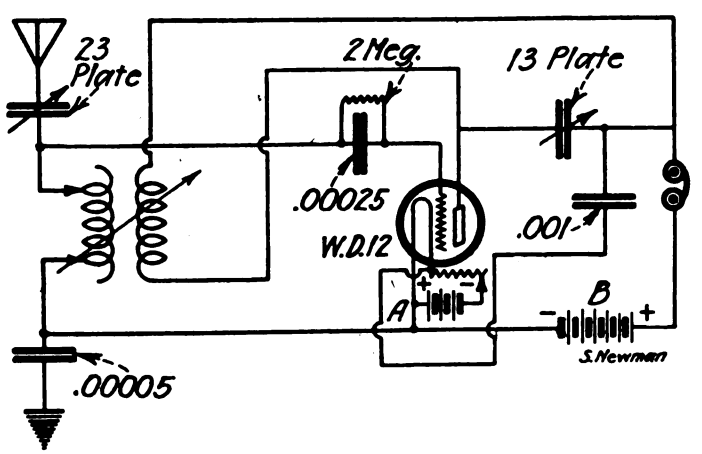
Another Improvement on Single Circuit Receivers

By A. A. Teeter

IN perusing the literature on the subject the fact is very prominent that there is a wide difference of opinion as regards the efficiency of the single and three-circuit tuner. I have made an impartial study of all circuits possible since the first of the year, and have constructed from the best of material practically every one of the popular circuits, including many of the so-called "trick" ones, and have finally come to the conclusion that the real circuit is the single or three-circuit regenerative one.

They both have their advantages and disadvantages, as we all know, but after having made exhaustive experiments with both, I must admit I have found the single circuit, properly constructed with a few additional refinements, the better thus far. However, I am using both at present.

The first question to arise in the minds of your readers will be: Is it selective and sensitive? Yes; extremely so, the most selective and sensitive I have ever



Schematic diagram of one method of improving the regular single circuit set through the use of two condensers in the plate and plate filament circuits. Greater selectivity and control of regeneration is thus possible.

operated. As an example, I can set my antenna condenser at 0 and using about 60 turns of the primary inductance, within a range of 0 to 50 on the secondary condenser dial I have tuned in WJZ, WOR, WGY, WHN, WEAF, WAAM, WBZ, KDKA, WEAS, WJAX, WFI, WOO and WIP. Sometimes, merely a fraction of a turn of the vernier of the secondary condenser will throw out WHN and bring in WGY. I do not have to sit up until midnight to get distant stations. One night during the last week of July—a hot night at that—between 8:30 and 11:00 o'clock, I tuned in the following stations, loud and clear, on detector: WOO, WIP, WFI, WDAR, WHN, WEAF, WJZ, WGY, KDKA, WBZ. On the detector and one stage audio, using phones: WJAX, WLW, WEAS, WAAF, WDAP, WOC. On the detector and two stages audio, with loud speaker: KDKA, WGY, WJAX, WWJ, WEAS, WBZ and WMAF.

Regarding the construction of this set, I have made two of them, each one using different material and parts, and the results obtained were *not* the same. Therefore, in justice to all who may want to construct this set, I will mention the manufacturer of the various parts, though I am not partial to any manufacturer's merchandise.

You will recognize this hook-up as that of the single circuit regenerator, the tickler shunted with a condenser, and the addition of two condensers so placed as to give high efficiency.

Material needed for detector unit: 1 panel, 7x18; 1 baseboard, 6x16x½; 1 vernier rheostat (Cutler-Hammer); 1 socket (Fada); 1 double circuit jack; 1 two-meg. leak, tubular R. C. A.; 1 .00025 Micadon condenser; 1 coupler (either Shamrock or Fisher No. 52); 1 13-plate vernier condenser (U. S. Tool); 1 23-plate vernier condenser (U. S. Tool); 3 switch arms and contact points; 1 .00005 Micadon condenser, 1 .001 Micadon condenser; 3 3" dials; 1 pair Brandes phones; 1 WD12 tube; 1 22½ volt Burgess battery; 1 spool of No. 16 plain copper wire (do not use bus wire); spaghetti, tin foil, binding posts.

In constructing the set shield the panel with tin foil and ground it, and note carefully the following:

Connect the rotor plates of the 23-plate condenser to the aerial.

Connect the rotor plates of the 13-plate condenser to the phone.

Run one of the leads from the secondary (rotor of variocoupler) to the stator plates of the 13-plate condenser, thence to the plate connection on socket.

Run the other lead from the secondary to the rotor plate of the 13-plate condenser thence to the phone, as previously referred to.

Connect the .001 fixed condenser between the filament (-) pole of the socket and the rotor plates of the 13-plate condenser.

In reference to the .00005 fixed condenser in the ground lead, arrange a switch whereby you can cut it out and in. It will not be needed for local reception, but has a tendency to clear up the disturbance on distant stations.

Use 22½ volts on plate of detector.

I am located on the west side of a mountain, 40 miles from New York, with a 45' aerial single copper wire between two trees 25' high. I can tune in New York and Philadelphia stations on detector alone without ground or aerial, and Schenectady without ground. This, I think, indicates in itself how sensitive the receiver is.

For amplifiers I use 201A tubes and Federal transformers. With this set I have, since June 1st, tuned in all the principal broadcast stations east of the Rockies, including such distant ones as WDAF, WIAK, WOC, WMC, WFAA, WBAP, CFCA, WSB, WDAP, WAAF and KYW.

What Not to Expect

IT is quite evident from the letters and reports of various makers of home-made sets, that they expect entirely too much from their receivers. They have read reports of records made by single tube receivers that cover 2,000 miles. Consider the fact that this is not a *steady performance*. It may be done in certain localities quite often, where there are no steel buildings, tall hills or forests, but to expect a single tube receiver to have a steady range of 2,000 miles is out of the question. Consider yourself good if you can get 900 to 1,000 miles out of it, and wear a happy contented smile.

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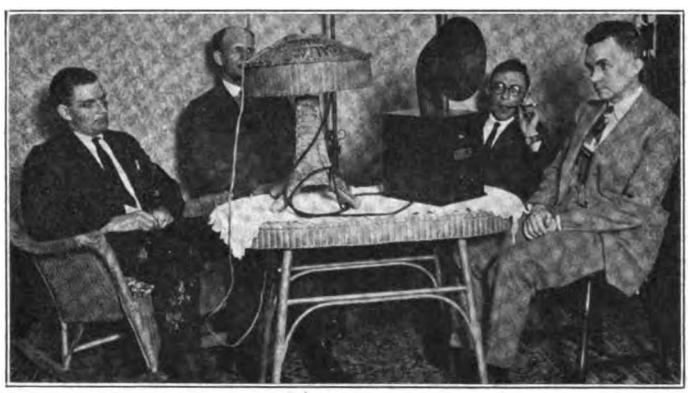
Practical Wired Wireless Demonstrated

WHEN General George O. Squier made the announcement some months ago that he had perfected a system of "carrier current telephony" whereby radio telephone signals were sent over high tension or lighting lines, quite a furore was created in radio circles, and many suppositions regarding its possibilities were made.

The North Amercan Company, one of the largest public utility corporations in America, seeing great possibilities in the system toward supplying users of commercial electric light with "wired radio" obtained permission to use the system, under the basic patents of General Squier. Its subsidiary, Wired Radio, Inc., has since then perfected the system and is putting it into active use.



(C. Kadel and Herbert)

An installation of a two-tube "Wired Radio" receiver in a house. Note the fact that it is very compact and has but one dial for adjustment. R. D. Duncan, Jr., and engineers of "Wired Radio," listening in.

Wired Radio is just what its name signifies. Instead of allowing the radio waves to emanate into space, they are confined to the limits of the lighting system. Thereby any one supplied with electric lighting, by the use of the proper apparatus, is enabled to receive radio signals anywhere in his home where there is a light socket simply by plugging the receiver into the light socket.

At the transmitting end, the system resembles the regular broadcasting station. There is a studio with its "pick-up" devices or microphones. The sound waves are carried along to the amplifiers where they are boosted up preparatory to being put into the transmitter and sent out along the wires. The transmitters being used were developed by the engineers of Wired Radio, Inc., especially for this purpose.

The receivers used to make the music audible to the people desiring the service were also specially designed. They are made to be as near fool-proof as possible. In the receivers that will be used there is just one dial and a crystal detector. A fixed crystal detector is being perfected that will eliminate that adjustment.

It is easily seen that with this system, no antenna or ground being necessary and only one dial to operate that it is indeed "simplified." At present music or broadcast programs will be sent on only one wave length, therefore no tuning will be necessary after the first adjustment.

The method to be pursued by Wired Radio, Inc., is as follows:

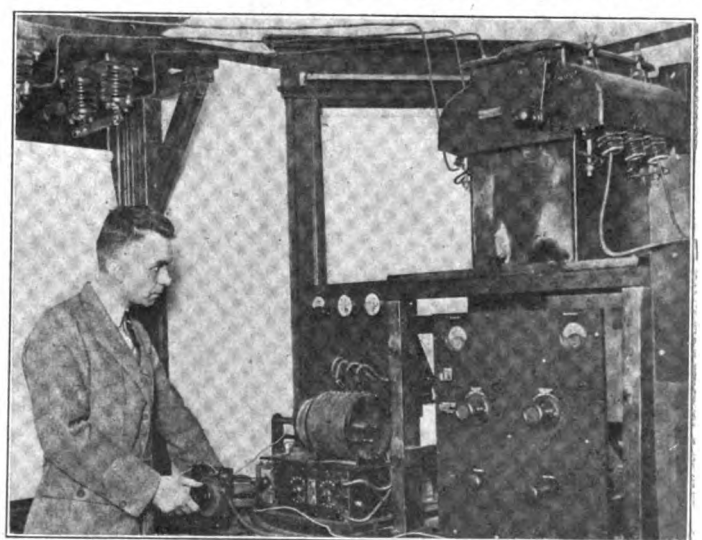
The users of electric light desiring to receive the programs that will be sent out over the Richmond Light and Railroad Companies Electric Lighting lines by Wired Radio, Inc., will be able to choose from three sets which have been standardized. The first is a crystal set, with ear phones; the second is a two-tube receiver with loud speaker, and the third a three-tube receiver with loud speaker. The crystal receiver will rent at $2.00 per month, the small loud speaker set will rent at $3.50 per month and the large set will rent for $5.00. The receivers remain the property of Wired Radio, Inc., and their use will be billed the same as the regular electric light service.

The service is installed on Staten Island, N. Y., and a demonstration of it was given to a group of press representatives on August 29, 1923.

The studio, which is at present a private house in Staten Island about one mile distant from the power house is where the programs will emanate from. On the first floor is the studio, draped with heavy hangings and having the necessary "pick-up" devices for broadcasting of piano music, talks, or orchestral selections. On the second floor are the amplifiers and transmitters, as well as a United Press Station where United Press reports will be received direct, and all the latest news will be given from the studio. The transmitter is coupled with the high tension lines that supply Staten Island, and radiate the energy directly over these lines. On the top floor is a loop receiver comprising four stages of radio-frequency (one of tuned radio, three of broadly tuned or transformer coupled) detector and power amplifier, operated on a two-foot loop. This receiver will also be used to pick up the programs sent out at the present time by the broadcasters, amplifying it, and re-transmitting it over their wired radio system.

It will only be necessary for the subscribers of the Wired Radio, Inc., to plug their sets into the sockets and turn on the light in order to receive the programs.

The wired radio program will consist of complete news service supplied by the United Press. Reports of all sporting events, time service, fashion, health food, housekeeping, gardening talks, stories, reviews, lectures, all kinds of music and reports of various functions. Its programs will start at 7:00 in the morning, and continue until 11:00 at night. It is expected to provide as soon as a survey is made of the programs that are desired two or three different types of programs on different wave lengths.



(C. Kadel and Herbert)

R. D. Duncan, Jr., engineer, adjusting the wired wireless transmitter. Note that it is directly coupled to the 2,300 volt high tension transformers through the switching arrangement on the window over his head.

The personnel of Wired Radio, Inc., is: C. W. Hough, president; R. D. Duncan, Jr., chief radio engineer; James T. Kolbert, editor news service. Wired Radio Service Co.: J. A. Mears, president.

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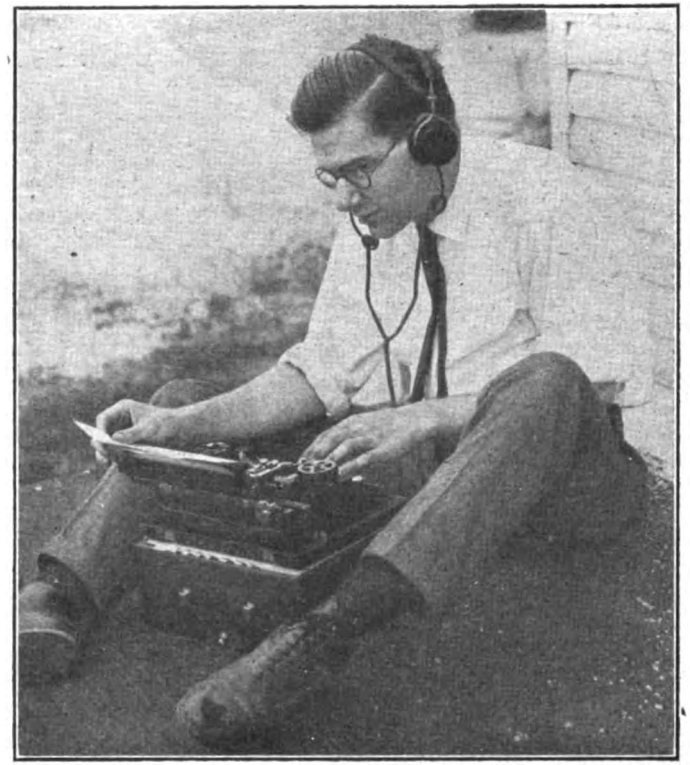
Radio News Pictures Arranged Poster-wise

(C. Kadel and Herbert)

Here is one of the scenes that the radio audience recently "heard" from the drama "Thumbs Down" broadcast from Station WOR, Newark, N. J. The play was summarized before beginning, as to settings, and the cast, and then was broadcast in the manner shown. Music was played between acts, and the ringing of a gong warned the folks of the "rise of the curtain." The illustration shows John Marston, Sue MacMananamy and Howard Lang, the principals, acting one of the "tense" scenes before the Mic.

Jud Landon, Apostle of the Great Outdoors, who recently gave a series of addresses at WGY, Schenectady, N. Y. He has given talks on fishing and hunting and has accumulated quite a number of followers who like to listen to him, even though they cannot follow his methods of "smoking out a bear" or "fighting a giant tuna fish." The illustration shows "Jud" in front of the new "glow-discharge" microphone.

(C. Underwood and Underwood)



Kenneth M. Swezey, the writer for RADIO WORLD and who is a favorite with many fans, is here shown "picking ideas" out of the ether while sitting on the roof outside his room. With his trusty Corona and radio set, he can get them as they "come through" and keep right on thinking up new ones for the fans to play with. This is, by the way, a good way of testing out your speed in copying. If you can type code messages at 30 per minute as they are sent, you need have no fears about getting a "1st Commercial."

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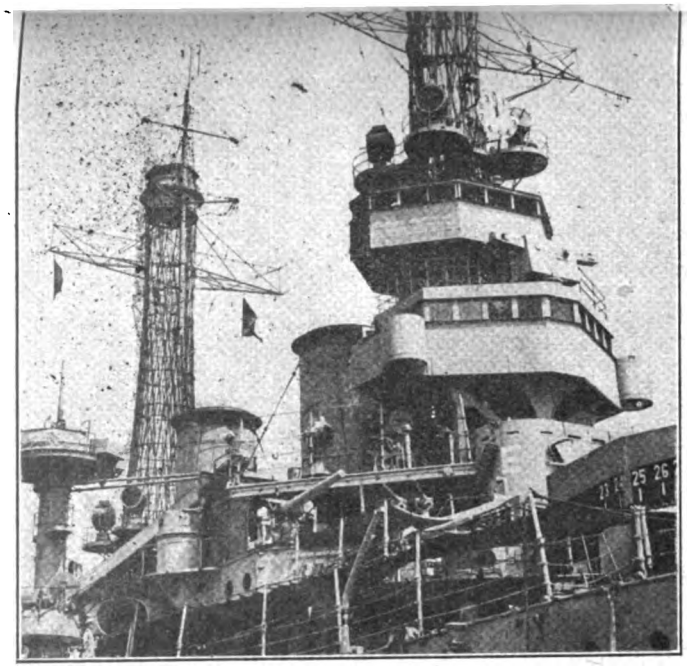
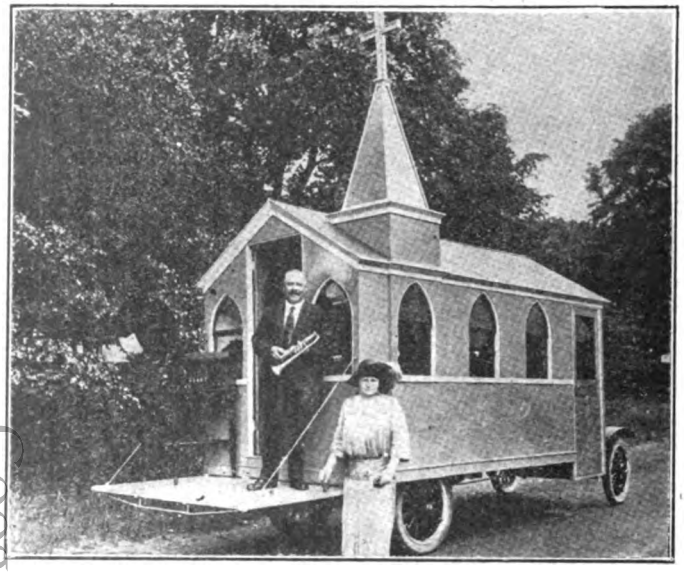


(C. Kadel and Herbert)

You fans who think you have elaborate antenna systems take a peep at the antennae of the U. S. S. "Wyoming," one of the latest battle ships. Four antenna systems can be used either separately or together.



(C. Gilliams)

A curious sight these days in and around staid Boston is the "Radio Church on Wheels." It is a replica of a church, mounted on the chassis of a car. Sermons and sacred music are received over the radio and broadcast to the open air crowds. Therefore, even the ones who claim they "live too far from the church" cannot get away from this ardent evangelist and his wife.

brother rig up a crystal set that she used on a loop aerial, and parades around the park near 2LO and hears the programs as they are broadcast.

(C. Atlantic Foto Service)

An idea for radio fans who want a good small loud speaker. An Atlantic City amateur discovered that an ordinary conch shell when properly attached would make an excellent loud speaker. A shell of that sort having absolutely perfect acoustics gives a volume of sound that is really surprising. Compare the entire loud speaker with the plug alongside of it.

(C. P and A Photos)

Mrs. H. A. Leslie, of Los Angeles, who claims that she was cured of a serious illness, by hearing Aimee Semple MacPherson, noted woman Evangelist, over the radio, while practically waiting for death. The illustration shows Mrs. Leslie listening in on the set she says was responsible for her marvelous cure.

(C. Kadel and Herbert)

Judge Ben B. Lindsay, of Denver, examining the new radio set he has just bought. It is the RC receiver with power amplifier and loud speaker. If it was not for the fact that there is no jack in the detector panel, and no battery connections to the loud speaker, we might tell you that he was listening to WEAF, but we cannot do anything so obviously wrong. Anyway, it is enough to state that Judge Lindsay is a "reg'lar fan."

(C. P and A Photos)

Radio detachment of the 69th Regiment in camp at Peekskill, N. Y., setting up their portable field set for practice. The set used is a combination receiver and tube transmitter, being operated by means of storage batteries, which, while not considered portable in every sense of the word by average fans who have to lug them to the battery shop every two weeks, are portable for this type of work and furnish steadier current than a hand driven generator.

Four girls crabbing with the aid of radio. They are using a regenerative set, with two wires in the water for antenna and ground. The one wire used for an antenna is well insulated and the open end sealed with wax to prevent contact with the water. The ground wire is bare and both are trailed in the water. Makes a good antenna, too. And by-te-bye, although you cannot see it in the picture, the young lady wtih the earphones has just landed a crab in her net.

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RADIO PRIMER
For the New Army of Radio Beginners

LOCATION OF TROUBLES IN A RECEIVER: After a fan has constructed a receiver or even bought one, there is no guarantee that little minor troubles will not occur. If he is a beginner he will fuss around and probably spoil the receiver, or cause trouble, where none existed. Therefore by knowing just where to look for the minor troubles he can obviate the necessity of calling in "expert" advice.

The commonest trouble is probably due to faulty connections. For some unknown cause, wires will come loose without the least apparent reason. The first place to look for trouble in that line is in the B battery circuit. Examine your connections to the set, and see that all the connections from the batteries are tight, and the wires scraped clean. Examine your antenna and ground connections and see that they are all tight.

If the set has been carefully soldered, and the mechanism has not been fooled with, there is no use to look at the connections inside unless lugs have been used to fasten the wires under the binding posts. If such is the case, light the tubes and very carefully joggle each lead. Do not feel too strong when doing this, and do not use any metallic instrument such as a screwdriver. Rather use a pencil or your fingers. If there is a loose connection it will immediately show by various clicks and the connection should be tightened.

Should all the connections be found tight, examine the tube by taking it out of the socket and seeing that all the lugs are clean, and making positive contact with the socket.

Probably one of the commonest causes of faulty operation is the use of poor B batteries. A B battery can be in fine condition one night and will rapidly fall in value until it will probably just operate or operate spasmodically. Therefore test your batteries by means of touching them quickly to a voltmeter. Do not hold the voltmeter across the battery as it will short circuit and be no good altogether.

Next examine your plug and phone cords. The tinsel inside the cord is fragile, and ofttimes breaks off inside the cord, the outside not showing the break. Therefore examine your plug and jack, by connecting a weak dry cell across it. If no response is given to the connection, remove the tips from the plug, and connect it across the battery, and then carefully "feel out" the cord by holding it in the hands and wiggling the cord an inch at a time looking for the break.

Should you prove unsuccessful in finding the trouble after the above take the phones and battery, remove the tubes from the socket, and individually test out each connection by means of the battery and phones, taking particular care with the inductances and transformers, always testing out on both sides of the condensers, and also across the condensers, to determine if any of them are blown or shorted. A condenser when the phones are thrown across with the battery should not give any response when the connection is made and broken. If it does the condenser is shorted and should be taken out.

A little care taken in the testing instead of madly searching around with fervid brow and beating heart, and by reasoning everything out before "flying off the handle" and wrecking the set without any cause, will ofttimes help more than calling in one of your friends and having him wreck the set for you. The old saying of the miner who was packing "grub" up the mountainside should prove of value to everyone in this case—"Slow and steady, does it, son."

The Radio Woman

FRIEDA, the General of the Kitchen, otherwise known as the cook, had been looking askance at radio for some months. "Dot aind't right—Gott nefer made beobles to make music in the air, and I woun't listen from it," used to be her daily speech, as she would hurry to the kitchen and slam the door. She is a really good cook, so we decided to humor her and turn the set off when she was feeling particularly bad about the matter. The inevitable change has come, however, and now Frieda wants us to put "one of dos radios" where she may hear it. The reason for the sudden change is that her cousin, who has been out west for years, recently returned and told her that he is a research engineer in one of the western radio plants. He had quite a rumpus with her, but he told her that it was not "defil's magic," and even went to the trouble to take her down to the city on her day off and let her see how it was done.

* * *

Isn't it queer what notions some people take into their heads? F. H., who is now considered quite an expert on radio troubles, was called in by a friend living down the block to find some trouble on the receiver that he had just made, and which wouldn't tune a bit. As a matter of fact, every station in the world seemed to be mixed up in one grand jumble, with code and everything.

"Well," commented Friend Husband afterwards, "outside of the fact that he didn't use the coils prescribed, but had a bright notion that honeycomb coils used in place of the special bank wound and other coils would be better, hearing that they were more efficient, and also using two condensers where they were not supposed to be, and using any kind of wire and wiring it up exceedingly messy, with too much paste and tons of solder, he had it worked out very well. It's a wonder to me that it even peeped. If some of these amateur constructors would read the articles thoroughly, and pay less attention to their 'radio expert' friends, who have probably built one home-made set and get all their knowledge from having bright thoughts on the subject, I think that everybody who attempts the building of a set would be helped immeasurably. I think I'm going to start a school for radio men to teach them the art of soldering one wire to another. I think that a three-year-old child could have done as messy a job as that grown man did, but I am not sure."

* * *

Friend Husband, through his talking and talking and talking radio, finally persuaded his club mate and golf friend to get a set at one of the big stores. Accordingly, Billie purchased the set, hooked up a nice antenna according to directions, connected the batteries very nicely and then started in to listen. He is not a "dumb dora" by any means, having played around with tools and wires—but not radio—for quite some time, so that far he was successful.

About a quarter of eleven that evening, the phone bell rang, right in the midst of our Philharmonic Symphony, and Billie told F. H. that he had connected everything right, was perfectly sure he had, but couldn't get a sound out of it. Friend Husband groaned something about "pests" and put on his coat.

He was gone about 20 minutes when back he came, with a smile all over his face. "That wise man goes and hooks up his set and then leaves the tubes in their boxes lying on the table upstairs and tries for two hours and a half to hear something, and cursing the day that I ever pursuaded him to buy it!"

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Answers to Readers

Where can I obtain a circuit diagram using the following apparatus: WD11 tube, variocoupler, variable vernier condenser, switch? How do you place the condenser in series with the variocoupler?—L. B. Reid, 605 Van Nuys Bldg., Los Angeles, Calif.

A very fine article using the apparatus you mention, and giving very excellent plans for the building of the receiving and detector unit appeared on page four of RADIO WORLD April 14, 1923. All details are explained in that article which is well illustrated.

* * *

Will you kindly give me the address of Bob Kalmus, whose article appeared in a recent issue?—John Keiler, Los Angeles, California.

The address is c/o H. Baran Co., 2325 Broadway, New York City.

* * *

I have been told by friends that I should renew the cartridge in my lightning protector after every storm. I am located in such a position that I cannot very well do so without buying a whole box of the renewal cartridges. How can I eliminate the necessity for this?—Jacob Strausman, Ellenville, N. Y.

You have been misinformed. You do not have to renew the cartridge after a storm unless the antenna of your set is actually hit. This is a very faint possibility, so you need not worry about it.

* * *

Does the ground wire have anything to do with the correct operation of the receiver? My set tunes very broadly, being able to hear WJZ while trying to listen to WEAF or WOR. I use a loose coupler, crystal detector, phones and condenser. My antenna is 100 feet long, and my ground 45 feet from my set.—Alfred Kulick, New York.

Your ground lead should be as short as possible to make it. It is entirely too long. You will not be able to get sharp tuning on a crystal set, as no crystal set is capable of tuning out one station completely when its wave length is so near to that of another as the stations you mention.

* * *

Please inform me as to the effective wave length range of the spiderweb coils described by Arthur S. Gordon in RADIO WORLD Feb. 10, 1923.—Harry Vetter, 10807 91st Ave., Richmond Hill, N. Y.

With an antenna 100-150 feet long, these coils will respond to waves up to 600 meters.

* * *

I am contemplating the construction of a three tube set and have been seriously considering the inverse reflex described in RADIO WORLD by W. S. Thompson. Have also heard a great deal of the three tube neutrodyne and would like to have your opinion of which would give the best signals as to distance and volume where an outside antenna is absolutely out of the question. Will the duplex eliminate locals a little over a mile away? The single tube reflex that I am at present working does this, as well as several others I have constructed. The circuit therefore must be able to accomplish sharp tuning in order to be satisfactory. —Geo. P. Stamm, 1011 N. Wahsatch, Colorado Springs, Colo.

Both circuits you mention are excellent circuits. However, as between the two, the neutrodyne is probably capable of the best tuning as all reflex circuits using more than one tube are generally a bit broad in tuning. You can make no mistake in constructing the three tube neutrodyne, if you are careful to use the best parts and follow directions. When used with one additional stage of audio-frequency it is a wonderful "loud speaker" circuit, is clear and no distortion is possible. Suggest you write to the manufacturers for circulars and matter pertaining to the home construction of the circuit.

Will my detector and two-stage set (Atwater Kent parts) operate a loud speaker on WD-11 Tubes?—John Salbiston, Jr., Bayshore, N. Y.

You should be able to get sufficient volume from the set you mention to operate a loud speaker very nicely, depending, of course, upon the surrounding conditions. If you are in a "dead spot" you will not be able to.

* * *

In RADIO WORLD, August 4, 1923, you published a circuit by A. D. Turnbull. How many plates should the variable condenser .0005 mfd. have? From what part of the variometer is the third tap taken? How should I place the condenser on the panel in regard to inductive relation with the variometer?—Harvey Johnson, 47 Layton St., San Francisco, Calif.

The condenser mentioned should be 23 plates if of the rotary type. If the book type, you will have to get one which has that particular capacity. The third tap is taken from the wire that connects the rotor to the stator. In variometer construction, they generally make the rod that is used as the bearing act as the connector. Trace the connections and find out. You cannot place a capacitance in inductive relation to an inductance. This expression, when used, signifies placing two inductances together in such a manner that a current in one will "induce" a like current in the other, and therefore transfer part of the energy into the second coil. You cannot do this between a condenser and an inductance.

* * *

I am using a WD-12 tube on my receiver. Will using a two volt cell from a storage battery hurt the tube?—Carl Zuspan, 505 Watson Bldg., Fairmont, West Va.

You can use a two volt storage cell for the purpose you mention, if care is taken not to turn the rheostat all the way on. Suggest that you place an additional resistance in the filament circuit to prevent this happening by accident. One of the 25 ohm resistances placed in series with your regulation filament rheostat, and the slider moved down to the proper place will suffice, and act as a safeguard against burning out your filament.

* * *

Have you ever described the construction of a voltmeter? If so, in what issue?—Claude Schaffner, 67 Woodlawn Street, New Haven, Conn.

We have never described the construction of the apparatus you mention. Apparatus of this type cannot be made by the average amateur constructor because of the extremely fine work necessary. You can purchase one much cheaper than you could construct it. There are several good makes at a reasonable price on the market.

* * *

I have constructed a two-stage tuned radio-frequency receiver, two coils 3½" in diameter, 5" long, wound with 100 turns apiece of No. 22 DCC wire and tapped every 20 turns. They are shunted with .001 condensers. I have had good success with it, but notice that condenser 2 (that in the second stage) and the tapped coil have to be tuned higher than the first stage. Is this right? If not, how can I remedy it?—L. F. Jacobson, New York City.

The fact that you have to tune your condenser on the second stage higher than the first stage is correct. That is to make up for the amount of wire used in the first stage. You should not have to tune your coil higher, however, as there should not be such a great change as that. Try tuning your condenser higher and using the same value of inductance. As a general rule, the first condenser should read from 10 to 12° lower than the second.

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Latest Radio Patents

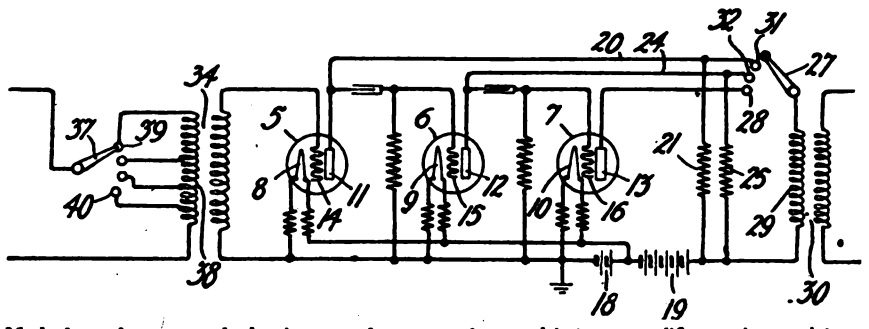
Multistage Amplifier Circuits

No. 1,459,419: Patented June 19, 1923. Patentee: E. O. Scriven, New York City.

This invention relates to multi-stage amplifier circuits and more particularly it relates to vacuum tube circuits wherein a plurality of repeaters or amplifiers are employed to amplify signals impressed thereon from an incoming line.

One of the objects of this invention is to provide a means for regulating the degree of amplification of a multi-stage amplifier set for signals impressed thereon.

As is well known in the art, weak currents or signals may be amplified to any desired degree by impressing them on a plurality of vacuum tube amplifiers arranged to work into each other by suitable circuit connections. In employing such a multi-stage amplifier set for amplifying weak currents, it is frequently found undesirable to use the total amplification of the set before impressing the amplified currents on the outgoing line or the receiving instrument, since the degree of amplification desired for each particular case will depend largely upon the strength of the incoming currents and on the electrical conditions in the output circuit into which the amplifiers work. It is also frequently desirable to cut down the degree of amplification to prevent overloading the last stages.



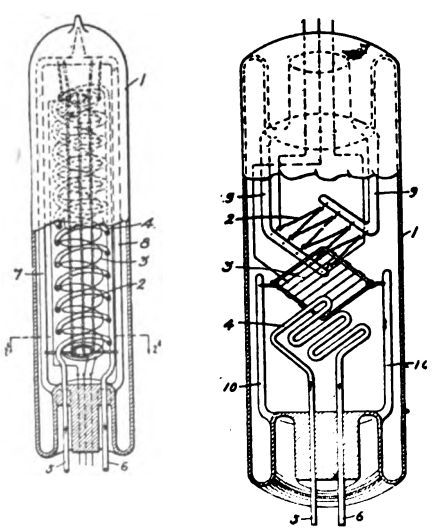
Method used to control the input and output of a multi-stage amplifier, using resistance coupling between the second and third stages, and switches to vary both the input value as well as the number of stages feeding into the output transformer.

In accordance with this invention, a single switching means is employed to cut in or out one or more of the plurality of the amplifiers so as to regulate the amount of amplification for any given case. An additional switch is also provided for regulating the strength of the currents impressed on the first tube so that by operating both switches any desired degree of amplification from the set may be obtained.

Electron Discharging Device

No. 1,459,417: Patented June 19, 1923. Patentee: Paul Schwerin, New York City.

This invention relates to electron discharge devices and especially to vacuum tubes of the audion type, and has as an object a device of the above character which has a very large power capacity.



Two methods of construction to be used in making vacuum tubes designed for transmitting or carrying excessive amounts of plate current. Elements are arranged to allow quick cooling preventing excessive heating of active elements.

In electron discharge devices of the audion type, two or more elements are used, one of the elements being a cathode or a source of electrons. Another element is the anode or collector of electrons. Under the action of a strong electrical field, the electrons from the cathode travel towards the anode, and acquire a high velocity. As a result of the electronic bombardment to which it is thus subjected, the anode becomes heated. This fact limits the power input, since excessive heating of the anode drives off the occluded gas, or may even melt the anode, destroying the device.

In this invention then, the purpose is to so construct and arrange the anode that it will be able to dissipate a very large quantity of heat. Such an arrangement will make vacuum tubes of this type largely independent of the heating factor, which heretofore has been a serious limitation to their efficiency. This result has been obtained by having a circulating medium in contact with one surface of the anode element to act as a cooling agent, and of the various agents which may be used, it has been found that water or oil is particularly suitable. This cooling of the anode, as herein described, has made possible a manifold increase in the amount of power which the audion tube can handle.

* * *

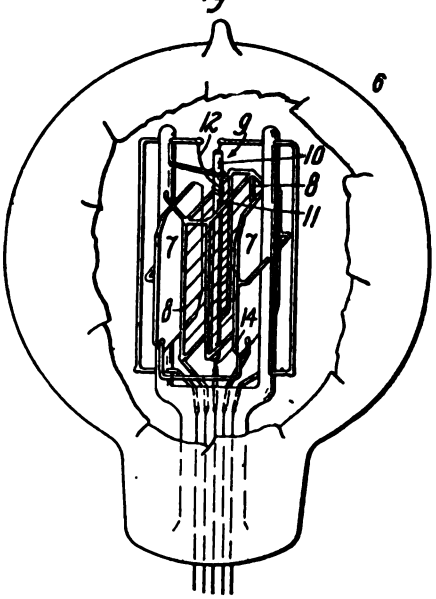
Thermionic Translating Device

No. 1,459,412: Patented June 19, 1923. Patentee: A. McL. Nicholson, New York City.

This invention relates to thermionic translating devices and more particularly to a form of cathode element for use in such devices, and its object is to produce a large energy output therefrom.

One way of increasing the energy output of a thermionic translating device, such, for example, as an audion, is to increase the active area of its cathode member. Where the cathode is in the form of a filament and is heated by a flow of current therethrough, the two ends of the filament will be at different potentials by virtue of this current flow and the resistance of the filament. When, as is customarily the case, the anode or plate element is made positive with respect to the filament by means of some external electromotive force, it is seen that there will be a greater difference of potential between the negative end of the filament and the anode, than between the positive end of the filament and the anode. There is, within certain limits, a direct relation between the output of an audion and the potential applied between the anode and cathode. It follows that other parts of the filament being at a higher potential than the negative terminal with respect to the anode, will not be working at maximum efficiency, the greatest inefficiency occurring at the positive end of the filament In other words, the space current between the anode and the filament will be unsymmetrically distributed. While this unsymmetrical distribution is not of great importance where short filaments are used, it becomes of serious importance when the length of the filament is increased to give a greater active area for the purpose of increasing the energy output of the tube.

Fig. 1



Arrangement of elements in a newly designed vacuum tube which overcomes several difficulties now present. The arrangement of the heated filament and its position with regard to the other elements is considered with regard to the space current flowing between the filament and anode.

This invention provides a thermionically active cathode which, while affording a large active area, will be devoid of the property of presenting a drop of potential between its terminals. It is in fact an equipotential cathode, that is, a cathode, all parts of whose active surface can be maintained at the same potential. Thus, an even distribution of space current over the cathode surface is permitted, and the cathode as a whole may be worked at its maximum efficiency. This result is obtained by divorcing the heating agent from that which produces the thermionic activity.

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Some Interesting Radio History

IN the early days of radio, following the splendid achievement of Marconi in transmitting the letter S across the Atlantic, scientists and engineers in this country and England believed that reliable long distance transmission and reception could be obtained by increasing the power on the antenna and by building higher antenna masts. As much as one hundred kilowatts were used on spark sets and the masts were sometimes 500 feet high.

J. T. H. Dempster, an engineer in the research laboratory of the General Electric Company at Schenectady, N. Y., and a pioneer in the field of radio, explains that the American amateurs are today communicating with English amateurs with 1,000 times less power than was used with indifferent results twenty years ago. "Insensitive receiving equipment," says Mr. Dempster, "was the cause of uncertain reception and it was not until the vacuum tube came into its own that rapid progress was made."

Back in 1904, a few years after Marconi startled the scientific world with his experiment that promised to revolutionize long distance communication, the General Electric Company engineers were actively interested in the new art and they, like others, tried for a long time to offset the shortcomings of receiving apparatus by boosting the power at the transmitting end. R. A. Fessenden, formerly a professor at the University of Pittsburgh and then head of the National Electric Signalling Company, was engaged to install transmitting and receiving equipment at the Schenectady, N. Y., and Lynn, Mass., plants of the General Electric Company with the expectation that this method of communication would replace the telephone and telegraph lines.

A. A. Isbell, now Pacific coast manager of the Radio Corporation of America, was placed in charge of the installation by Mr. Fessenden. A spark transmitter of the straight gap type was built. In order to keep the gap from arcing it was necessary to blow air across it at about 100 pounds pressure. The power was supplied by a 20 KW transformer charging a condenser composed of steel plates, separated by glass plates, all immersed in oil in a steel tank. A special relay breaking a very large current in the primary circuit was designed by Mr. Dempster, in co-operation with Mr. Isbell. In operation air was blown across the carbon contacts of the relay. Because of the high potential in the antenna it was possible to draw sparks from any insulated conductor within 100 yards of the masts. The antenna mast was 180 feet high and 96 amperes were used in transmission.

The receiving apparatus consisted of the famous Fessenden liquid barretter or, in better known terms, the electrolytic detector, which was used in connection with the Fessenden interference preventer circuit. The electrolytic detector consisted of a platinum wire coated with silver. This was known as Wollaston wire. The silver coating gave mechanical strength to the wire which was less than ten thousandths of an inch in diameter. The nitric acid in a platinum cup into which the wire dipped formed the electrolyte. The platinum cup was the other pole of the cell.

The electrolytic detector was a marked advance over the Marconi coherer but it was still much less sensitive than the crystal detectors now in use. Static frequently burned the point from the platinum wire temporarily destroying the use of the detector.

With this equipment sporadic communication was established between the two plants of the company during the cold months but reception was very uncertain in the summer. In efforts to improve transmission more power was used without improving reception. The test signal used by the operator in the two cities was the letter D—a long dash and two shorts—repeated hour after hour at a stretch. This became so tiresome that Mr. Dempster built a motor driven transmitter set for Schenectady and the machine relieved the tedious work of the operators.

The headphones adopted were especially made according to the navy standard and they were wound for the first time with enameled wire. These phones were about one-twenty-fifth as sensitive as the cheapest headphones on the market today.

In the early days of radio the signal acted directly on the receiving apparatus, whereas today, by means of circuits and B batteries, the signal is magnified from one to 25,000,000 times, the signal acting as a valve to regulate the B battery current. Back in the old days signals were occasionally received when fifty kilowatts were impressed on the antenna, using 180 foot masts. Today, an operator in Lynn with a three-bulb receiving set can get Schenectady signals 1,000 times stronger than was possible in 1903 and that from a transmitter using but five watts and a mast fifty feet high.

At the same time experiments were being carried on in Schenectady and Lynn, Prof. Fessenden was operating two very high powered stations using 100 kilowatts with 480 foot steel masts and umbrella antenna. One of these stations was located at Brant Rock, near Plymouth, Mass., and the other was at Machrihanish, Scotland.

Twelfth Edition of a Popular Radio Text Book

"WIRELESS Course in Twenty Lessons," by S. Gernsback, A. Lescaboura and H. W. Secor. 264 pp., many diagrams and illustrations. Experimenter Publishing Co., New York City. Price $2.00 net.

This is the twelfth edition of a standard radio textbook which has proved its popularity since its initial appearance in 1911. Many revolutionary changes have taken place in radio since this book was born but the authors have kept track of the progress made and the present edition has been completely rewritten in greatly enlarged form. The twenty lessons form a comprehensive course of instruction in radio and should appeal to the new and constantly growing army of radio enthusiasts.

New Signal Corps Pamphlet on Radio

A PUBLICATION giving an introduction to the subject of line radio communication has just been prepared under the direction of the Chief Signal Officer of the Army in co-operation with the Bureau of Standards. The pamphlet gives an explanation of how messages are carried to distant points by radio frequency currents directed over ordinary telephone lines or power wires. The fundamental principles of radio and its relation to line radio telegraphy and telephony are discussed. Copies of the work, known as Signal Corps Radio Communication, Pamphlet No. 41, and entitled "Introduction to Line Radio Communication," can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at ten cents per copy.

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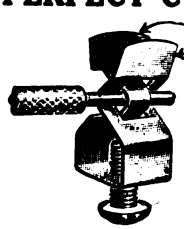

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National Radio Week Will Be from Nov. 25 to Dec. 1

THE National Radio Week Executive Committee of the Radio Trade Association has decided to hold National Radio Week this year from November 25 to December 1. Details may be secured from L. A. Nixon, secretary of the Radio Trade Association, 1133 Broadway, New York City.

Pierre Boucheron, manager of the publicity department of the Radio Corporation of America, will head a special committee of publicity men who will use their combined efforts to forward the interests of this important event.

H. Gernsback, editor of RADIO NEWS, as chairman of the publicity committee of the Radio Trade Association, will urge the co-operation of the trade at large in making National Radio Week a success.

A special committee of the leading directors of broadcasting stations is now working out a type of program for the week which will permit every broadcasting station in the country to co-operate in making their programs especially appropriate to the event and attractive to thousands who now do not own receiving sets.

National Radio Week will mark the opening of the buying season for the holiday trade. Every radio firm who takes advantage of this opportune publicity should reap great profits.

Any one with ideas to make National Radio Week even more successful is invited to address the secretary, Mr. Nixon, or any member of the executive committee which is composed as follows:

F. Clifford Estey, National Chelsea Radio Corp., Boston, Mass.

Arthur H. Lynch, RADIO BROADCAST, Garden City, N. Y.

Arthur H. Halloran, publisher, RADIO, San Francisco, Calif.

Theordore R. Gerken, The Marshall-Gerken Company, Toledo, Ohio.

Benjamin Gross, Radio Stores Corp., New Yok City.

Roland Burke Hennessy, publisher, RADIO WORLD, New York City.

Major J. Andrew White, WIRELESS AGE, New York City.

United Cigar Stores Trying Out Radio Sales

THE United Cigar Stores Company last week began an interesting sales experiment in three of its New York City stores.

Standard radio sets and parts were placed on sale in charge of experienced salesmen. The object is to determine whether the public will buy radio goods through a cigar store.

No cut price goods of any kind will be carried and only standard sets and material will be stocked. Competent advice and service will be given to all purchasers.

If the experiment proves successful, it should afford a tremendous outlet for radio goods of every description, as the United Cigar Stores Company is one of the largest and most profitable retail selling organizations in the world.

The radio industry will await with great interest the verdict of the public and the decision of the United Cigar Stores on this interesting and very important experiment.

A Good Thing Worth Repeating

Sol Kahan keeps a prosperous news, stationery and cigar store at 305 North Avenue, New Rochelle, N. Y. He sells a great many RADIO WORLDS in the course of a month. We noticed recently that Mr. Kahan had two unsold copies of RADIO WORLD of August 11 on his stand. A few days later he was asked if these copies had been returned to the American News Company, and he replied, "No, I keep my back numbers of RADIO WORLD in stock and sell them out, sometimes quite a while after their dates. I find there is a good demand for back numbers. In this way I always sell out my full supply of RADIO WORLDS."

Here is a tip worth following by other newsdealers.

Coming Events

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits, Atlantic City, N. J., June 16 to September 8, 1923.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th St., New York.

AMERICAN RADIO RELAY LEAGUE, second national convention, Chicago, Ill., September 12-15, 1923. Chicago Radio Traffic Association, 959 The Rookery, Chicago, Ill.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

B. A. Harden, Le Roy, Minn.
A. J. Benkett, 966 South State St., Syracuse, N. Y.
Nate W. Hunter, 641 Palmwood Ave., Toledo, Ohio.
Leonard Klarnet, 165 Beach 117th St., Rockaway Park, N. Y.
Charles Woodhams, 808 Center St., Chicago, Ill.
Summers T. Carter, 1507 Pechin Ave., Roanoke, Va. (Dealer.)
John Elker, 542 South Third Ave., Kankakee, Ill. (Builds sets.)
M. G. Stevens, Kendall, N. Y. (Dealer interested in power amplifiers.)
C. C. Lewis, 49 Main St., Fairchance, Pa.
Virgil R. Harbert, Lumberfort, W. Va. (Builds sets.)
R. F. Siggelkow, 316 East Prairie St., Lanark, Ill. (Builds and remodels sets. Interested in parts.)
Wm. R. Holloway, 1333 Locust St., Norristown, Pa.
James F. Clark, 142 West 82d St., New York City. (Interested in up-to-date variocouplers and variometers.)
Sam Chernetzley, 593 Stone Ave., Brooklyn, N. Y. (Wants to buy a set.)
H. G. Bergman, 103 Lake Ave., Mariners Harbor, N. Y.
Manley G. McKinley, Mendota, Mo. (Retailer.)
F. E. Whitcomb, Jr., 3838-a Blaine Ave., St. Louis, Mo.
W. B. Shanafelt, Sigourney, Iowa.
W. V. Trott, 9 Barker Ave., Hamilton, Ontario, Canada.
Gail Bartlett, Atlanta, Macon County, Missouri.
Donab Fregoll, 16 Washington St., Central Falls, R. I.
Max Robbins, 296 Georgia Ave., Brooklyn, N. Y. (Builds sets.)
William Devereux, 1371 Green Ave., Brooklyn, N. Y.
Michael E. Kondrat, 94 Exchange St., New Haven, Conn.
Anthony C. Budenkaye, 45 First West St., East Plymouth, Pa.
Guy M. Chase, 677 Garden St., Elizabeth, N. J.
A. D. Coleman, Farragut, Iowa.
John Daly, 45 Enterprise St., Adams, Mass.
Joaquin Sangenis, Perla No. 15 (Gracia), Barcelona, Spain.
Arthur Cauffield, 908 Lafayette St., Niles, Ohio.
Arthur G. Davis, 624 Vine St., Camden, N. J.
Sam Barclay, 1812 Washington St., Fort Worth, Texas.
George T. Vallee, 17 Commerce St., Norwalk, Conn.
George Broadbent, 18 Cross St., Mifflintown, Pa. (Distributor.)
A. Abbati, 319 East 152nd St., New York City. (About to start a retail radio business.)
H. B. Hassinger, 654 12th St., Newark, N. J.
August Nardore, 7001 Tenth Ave., Brooklyn, N. Y.

Putting Radio on the Map of the World

P. C. KULLMAN & CO., 110 Nassau Street, New York City, specialists in wireless securities, are continuing their efforts to "put radio on the map of the world" and have issued the seventh of a series of circular letters addressed to government officials in charge of wireless in 112 foreign countries. The firm has secured the services of E. Walker Sawyer, I.R.E., who will answer any technical or commercial questions addressed to him as above, in English, French, Spanish, Italian, German or Portugese. Replies will be made by mail, cable or radio as the inquirer directs.

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National Radio Chamber of Commerce Will Demonstrate Radio to Farmers

THE National Radio Chamber of Commerce, 165 Broadway, New York City, assisted by the manufacturers and distributors of radio, has begun a campaign for the purpose of educating farmers in the practical everyday value of radio on the farm. The importance of this movement to the radio industry may be judged by these facts:

The population of the United States is one-third farmer. But, economically, the farmer is more important than is his voting power. He possesses *one-half the country's buying power.*

Because of his daily need of weather, crop and market reports, and because of his need for the recreation and educational means furnished by radio, the farmer is, potentially, *the nation's biggest user of radio.*

The National Radio Chamber of Commerce has first hand information in the form of letters and telegrams from hundreds of farmers' organizations in New York, New Jersey, Pennsylvania, Ohio and other states, and from the national organizations, which indicate that the leaders among the farmers are keenly interested in radio.

The National Radio Chamber of Commerce has been assured by these leaders of their co-operation in such a program.

The manufacturers and distributors of radio equipment are entering into the plan and are sending out demonstration parties with receivers and loud speakers, the chamber securing for them also the privilege of exhibiting their lines and taking orders.

The demonstrations have so far been chiefly confined to "County Picnics." Those in New York State occurring in September have an estimated attendance of more than 160,000, more than half of which will be covered by demonstration. Following these picnics, the county fairs furnish the next opportunity to reach the farmers in large number. These are beginning now and extend well into the fall and offer ideal opportunities for educational work of this sort.

The National Radio Chamber of Commerce calls upon all manufacturers and distributors of radio equipment, regardless of affiliation, and all manufacturers' and distributors' organizations to assist in this movement, co-operatively, if possible—independently, if they must.

It is "seed sown upon good ground!"

New Radio and Electrical Firms

Ponder Motor Manufacturing Corp., Wilmington, Del., $2,500,000. (Colonial Charter Co.)

American Batteries, Dover, Del., $1,500,000. (U. S. Corporation Co.)

Admiral Electric Corp., Brooklyn, N. Y., to deal in mechanical appliances, $10,000; B. and J. Storch. (Attorney, B. Berger, 225 Fifth Ave., New York City.)

Automatic Repeating Phonograph Co., Wilmington, Del., radio transmission, $1,000,000. (Corporation Service Co.)

Non-Tenna Radio, Queens, N. Y., make wireless instruments, $25,000; J. H. and M. F. Weatherlow, H. Brand. (Attorney, W. Rasquin, Jr., 305 Broadway, New York City.)

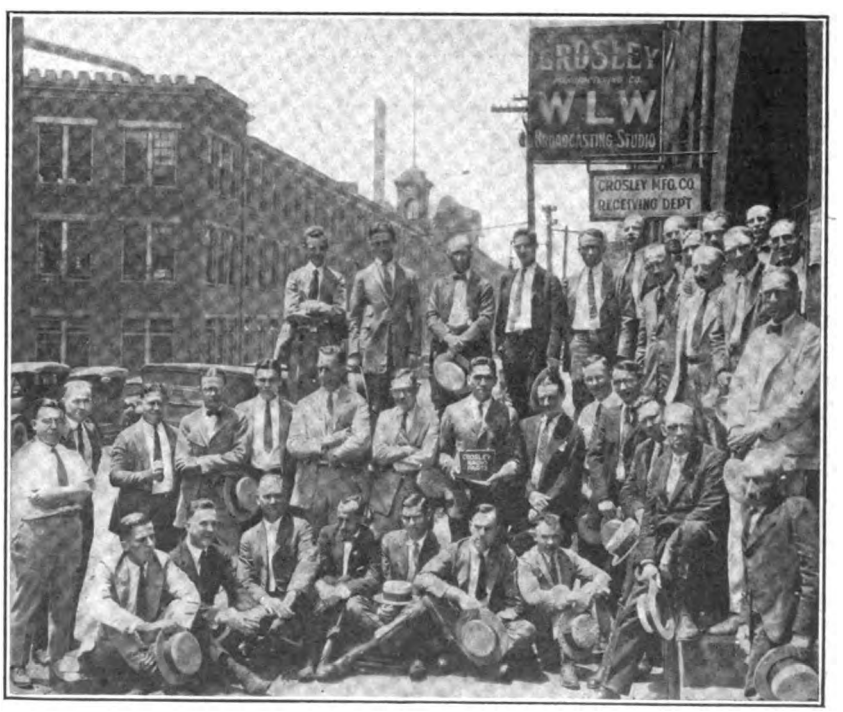
Electra Brokerage Corp., New York City, make electric products, $100,000; R. Fisher, I. A. Siddons. (Attorney, G. Price, 66 Broadway).

Webster Radio Corp., New York City, make radio parts, $10,000; L. Kaplan, F. R. Linden, R. E. Sackstein. (Attorneys, Glaze & Fine, 217 Broadway.)

Electrical Art Shop, Glens Falls, N. Y., $10,000; E. L. and F. D. Hubbard. (Attorney, D. F. Imrie, Glens Falls.)

Newbrook Radio Sales Corp., New York City, $50,000; H. H. Southgate, S. I. Godley. (Attorney, S. Sternfeld, 15 Park Row.)

A Lively Radio Sales Aggregation



Delegates to the first radio sales convention held recently by the Crosley Manufacturing Company at Cincinnati. The picture was made at the entrance to the company's manufacturing plant, which also houses Broadcasting Station WLW

A Radio Song Prize Contest

MR. FRED FISHER, of the Fisher Music Publishing House, New York, announces that he has completed arrangements with I. R. Nelson Co., operators of WAAM, Newark, N. J., for a novel popular radio song contest that will start September 11 and continue through seven broadcasting evenings until September 27.

Mr. Fisher's new song hit, "M. T. Pocket Blues," will be broadcast each of the seven evenings by Fisher's song artists at WAAM. The contest is as follows:

First Contest—A prize for best letter of not over two hundred words telling why the writer liked or did not like "M. T. Pocket Blues." Prizes: First, one year's subscription for RADIO WORLD and one pair W. E. phones. Second, two Victor records or one piano roll.

Second Contest—A prize will be given for the best funny chorus written by any one who hears the WAAM contest. Prizes: First, two rolls or two Victor dance records, and one pair W. E. phones.

Third Contest—For radio fan sending in letter from farthest distance one copy of all the Fisher song hits will be given with a pair of radio ear phones.

Fourth Contest—The first ten telephone calls on each of the nights will receive an autographed copy of "M. T. Pocket Blues" by the composers, or each copy will be autographed by James Barton who featured this song in "Dew Drop Inn" at the Astor Theatre. In all, this will make seventy copies of the song that will be given away.

The following nights have been selected for the broadcasting contest of "M. T. Pocket Blues": September 11, 8.00-8.40 P. M.; September 13, 8.40-9.00 P. M.; September 18, 9.15-9.30 P. M.; September 19, 10.00-10.30 P. M.; September 20, 8.30-9.00 P. M.; September 25, 8.25-9.00 P. M.; September 27, 8.25-9.00 P. M.

All letters must bear the post mark of September 30 or before. Announcement of awards will be made October 17 at 8.40 P. M.

Radio Trade Notes

Anthony C. Budenkaye, 45 First West St., East Plymouth, Pa., informs RADIO WORLD that he intends to open a radio school this fall.

* * *

Joaquin Sangenis, Perla No. 15 (Gracia), Barcelona, Spain, wants to get in touch with manufacturers of tubes and dealers who stock UV199 and other tubes.

* * *

Alcon Electrical Supply Co., 86 Walker St., New York City, has been placed in the hands of Joe Healey as receiver. Liabilities about $9,000; assets about $3,000.

WANT TO
REPRESENT RADIO WORLD?

If you can get subscriptions for Radio World let us know and we will send you a generous proposition. Radio World, 1493 Broadway, New York City.

TELEPHONE NUMBER CHANGED

The telephone number of RADIO WORLD has been changed to LACKAWANNA 6976

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The Wireless Oracle

By Hirsch M. Kaplan

THE Skinner Organ Company's recital is a fitting conclusion at any evening's programme, but more so to a Sunday.

Have you noticed the revival of all the old popular and classical music during the past few weeks? Suppose the new music is slow in the coming or else the old is the best after all.

WBZ gave an organ recital that was on a par with many of our local ones.

Of all the programmes rendered by Roxy and his troupe this week's was by the far the best of them all. "Day by Day In Every Way They're Getting Better and Better."

See where this column must do some good, for as you might have noticed and as was suggested, the Alpha Syncopators and Bruno Brothers' Chin Lee Orchestras were with us again.

Lemme whisper somethin' to you! If you enjoy good plays with plenty of good music watch the programmes of the daily papers for when WGY is to broadcast a play, and take my word for it you will spend an enjoyable evening. Only the other evening they broadcasted a comedy, "The Country Boy," and it sure was the berries.

Giving dinners of welcome these days is getting mighty popular. First, they gave a dinner for our famous jazz king, Paul Whiteman, and this time it's for his second best, Paul Specht.

I suppose that many of you farmers in the vicinity of New York City have missed the noon market reports from WJZ. Well, don't let this bother you for if you will only tune a little higher you can get them from WEAF.

Phil Lunberg and his orchestra came through in fine shape from station WJAX of Cleveland, Ohio.

Another ivory tickler that made a hit with me is Mr. Brow.

WFI "verniered" its way through with a 75 per cent. orchestra.

WBS, your phonographic programmes may be all right, but the modulation of your station makes them sound worse than terrible.

"We have been assigned the call letters KDYR," writes the Pasadena, Cal., *Star-News,* but as Rube Goldberg says, "It doesn't mean anything," for "Yes! They have no transmitter" as yet.

It sure was some treat to have our old friend Betsey Ayres with us again. Yes, and as good as ever.

Congratulations, WDT, your modulation has improved.

If between six and seven P. M. you should hear a station offering a programme of orchestra selections interrupted occasionally by the giving of baseball scores, then you may be safely assured that this is station WFI, Strawbridge & Clothier, Philadelphia, Pa.

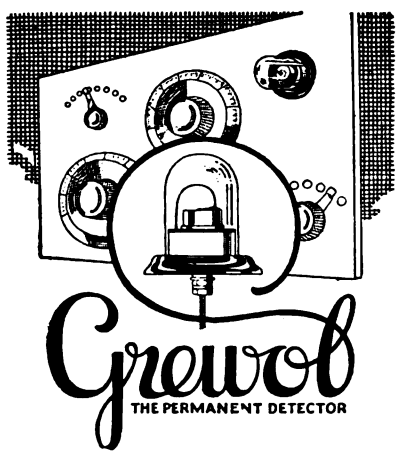
Paul Specht and his orchestra from station WMAF, "Way Down East" or "The Land of the Pilgrim Fathers," helped us to spend a pleasant hour.

The B. C. L.'s in the vicinity of New York City have long been crying for a Silent Night. This could be easily obtained if WHN would agree not to have a late programme on an evening when WDT was silent. Don't you think, WHN, that you are on the air long enough each day, and could afford to set aside a night for the dx fan? Think it over.

May Singy Bren sure can "Say It With a Banjo."

Edwin Franko Goldman nighted us for the last time other night. We sure will miss you, Frank, but let's hope that you will soon be with us again in the near future. So long!

WAAM, although a small powered station and on a low wave length, still makes itself conspicuous by offering popular programmes through a station that can rank with the best. That's the stuff. You sure do set a fine example for your complaining brothers.



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FIXED ADJUSTMENT

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Packed in individual carton with instructions. **$2.00**

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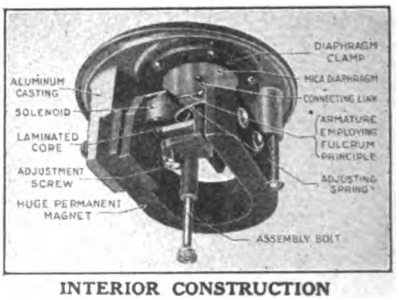
THE TRINITY LOUD SPEAKER

TYPE "A1"
21" FIBER HORN
$25.00

TYPE "B"
(For Phonographs)
$12.50



INTERIOR CONSTRUCTION

An ear phone is an ear phone no matter how fancy the horn that covers it may be, and, due to the delicate construction of an ear phone it is utterly incapable of giving true tone reproduction, especially, when relatively large currents are passed thru its coils, such as the output of a two-stage or power amplifier.

The Trinity Loud Speaker element embodies the well-proven and tested principles of the phonograph reproducer with the soundest principles of electromagnetic design best adapted for loud speaker operation. It is not an ear phone when placed on a head band and a loud speaker when covered with a horn. It is a sturdy loud-speaking element ALWAYS.

Send for Literature.

TRINITY RADIO CORPORATION
446 TREMONT STREET, BOSTON, MASS.

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All Broadcasters Urged to Join the National Association

EDITOR, RADIO WORLD: We have this day received what we believe to have been intended as a most threatening letter from the American Society of Composers, Authors, and Publishers, signed by Mr. J. C. Rosenthal. It particularly interests us to note how they refer to us broadcasters and the radio audience as "beggars who cannot be choosers." We believe that they have endeavored to say, in most adroit language, "We have the legal decision against you broadcasters (Federal Judge Lynch's decision in favor of Witmark Publishing Company against Broadcaster Bamberger). Now you *must* pay us, even though you do popularize our music." Frankly, they are right so long as we, the broadcasters, remain an unorganized entity.

Unquestionably the present copyright law favors this society, who, I am advised, were instrumental in having the law enacted. The society is a highly organized association with plenty of funds to employ and maintain their highly paid, highly skilled attorneys throughout the United States and unquestionably there will be a multiplicity of suits started within the next few weeks against many of the broadcasting stations throughout the country. Just so long as the present copyright law exists, we believe they can win against any broadcaster using their music.

They state in this communication that they will license the broadcasters to popularize their songs at tributes ranging from $200 to $5,000 per annum. Their fee for the first year will probably be small, or they may offer licenses to some of us free to get us to recognize their so-called rights, but the tribute will unquestionably be increased from year to year after once we have recognized them. This is not all. The next step will be the musicians' unions, then the payment of artists, and then the end of broadcasting.

Is it not high time that all the broadcasting stations got together by joining the National Association of Broadcasters, for protection if nothing else? If we remain unorganized, it is only a question of time when most of us will be forced to pay tribute to this and other societies. We have in prohibition an excellent example of the power of an organized minority against an unorganized majority. Do we want a repetition of this in broadcasting?

Station WJAZ is a member of the National Association of Broadcasters, which has its executive offices at 1265 Broadway, New York City, and unqualifiedly endorses it. We are receiving from the association their weekly release of new songs, on which we have not only the temporary, but the permanent rights to broadcast, even after *we* have popularized each new selection. Our orchester leader, Mr. Dan Russo, of the Oriole Terrace Orchestra at the Edgewater Beach Hotel, is not only playing our new releases received from the Broadcasters' Association for broadcasting purposes, but is using them as his dance numbers, because they are so excellent. The Chicago Daily News, who broadcast from the La Salle Hotel and who are also members of the National Association of Broadcasters, tell us that their orchestra leader, Mr. Scheetz, is doing the same.

Our station broadcasts *only* the music supplied by the National Association and other copyrighted music, on which the copyright has expired, and we, with pride, say that our programs speak for themselves.

We must also be highly organized, so that we may have a voice in opposing the passage of many bills proposing radical radio legislation, which bills are now in the files in Washington.

We are sending this letter out unsolicited, but we trust its message will bear fruit. It behooves every one of us broadcasters to get behind this National Association, join it, use their music, and thereby make *radio* music the most popular in the country and save ourselves from being forced to pay tribute to a society that has *no interest in us other than to collect fees.*

Cordially and sincerely yours,
ZENITH-EDGEWATER BEACH HOTEL BROADCASTING STATION WJAZ,
By E. F. McDonald, Jr.
Chicago, Ill.,
332 South Michigan Ave.

Radio World is $6.00 (52 issues), $3.00 six months, $1.50 three months, 15c. single copy. Radio World, 1493 Broadway, New York City.

REINARTZ CIRCUIT
GREEN SILK SPIDER-WEB COILS
NO COMPOUND USED
TYPE C $1.50
NOLTE MFG. CO.
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Dealers write today for our interesting proposition.
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Will ship C. O. D. subject to inspection, or allow 5% discount for cash with order. Order shipped same day received. WRITE TODAY.
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2 VOLT STORAGE BATTERY for WD11—WD12 $5.00
6 V., 60 Amps. $10.00
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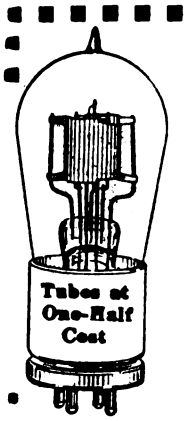
COMO DUPLEX TRANSFORMERS
The COMO DUPLEX SYSTEM of audio-frequency amplification gives the maximum volume without distortion and tube noise.

Type "I" Type "O"
COMO APPARATUS COMPANY
446 TREMONT STREET BOSTON, MASS.
There is a combined filtering action which assures perfect results when ordinary amplification fails.
It can be added to your present amplifier, giving you power amplification on the weak signals that more of the ordinary amplification would kill.
Sold only in matched Pairs, $12.50
A copy of C. White's "HOW TO MAKE A POWER AMPLIFIER" is yours for the asking.



IT HAS HAPPENED TO ALL OF YOU IN A FRACTION OF A SECOND!
WHEN the filament burns out, at least $5.00 goes with it to put the set in operation again.
WHY not save nearly one-half the cost of a new tube by sending us your burned out or broken tube to be repaired?
WE REPAIR EVERY TYPE OF tungsten wire filament receiving tube. All our tubes are TESTED and GUARANTEED to function as well as when new.
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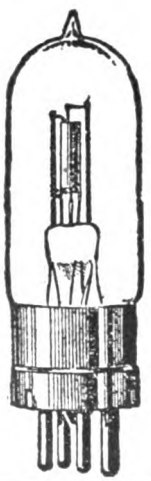

Send in Your Broken Down, Burnt Out Tubes

$1.50 AND UP

We Repair and Guarantee Them to Function Equal to New.

Mail Orders Promptly Attended to

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ROOM 510
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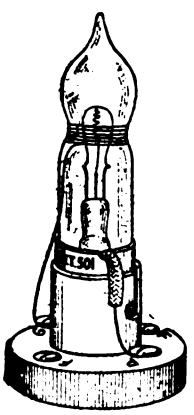
Improve Your Reception by using the WELSH PEANUT TUBE



Strong, velvety tone, no distortion, low initial cost; economical to operate, uses about ¼ amp. Can be operated on storage battery or THREE DRY CELLS. Filament 4 to 6 v. Plate 16½ to 32 v.

Price $2.00

Special Sockets....60c
Adaptors 75c

Sent postpaid on receipt of amount if your dealer has not stocked them.

Welsh Electric Lamp Corp.
69 Boylan Street
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Manufactured Only by the Welsh Electric Lamp Corp.
BEWARE OF IMITATIONS

Distance Reception with Two Controls.

If that is what you are after, and have not yet succeeded in finding it, send 15c for RADIO WORLD of Feb. 17, and see hook-up by G. W. May on page 11. RADIO WORLD, 1493 Broadway, New York City.

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Velma Carson Visits a Broadcasting Station

VELMA CARSON, who has contributed several articles to RADIO WORLD, recounts in *Farm and Fireside* for September her experiences while visiting a radio broadcasting station for the first time. Miss Carson's story, in part, follows:

Six months after first marveling on our farm at the powers of the radio, chance brought me across the country from whence the voices had come, to its home in East Pittsburgh. I would hunt up KDKA, I promised myself, and see what supernatural agencies were at work.

Arriving at the plant of the Westinghouse Electric and Manufacturing Company in East Pittsburgh one evening, I found myself at a door marked KDKA, near the main entrance of the plant. Maybe we had heard something real after all. I began to be sorry for my doubting. Or else they were going a long way to carry out the delusion.

I entered an office where a dozen or more persons were sitting about chatting and visiting. Violin cases, music rolls, and manuscripts were lying about in a convincing manner. Visitors were taking turns at a radio receiving set on the desk. A pleasant young man walked about playing host. Another tapped furiously on a telegraph instrument. A breath of excitement was in the air. A company taxicab stopped outside, and a couple rushed in breathlessly. It was twenty-five minutes after seven, and the world sat waiting. We all looked expectantly toward a door marked "Studio"—"SILENCE." Then it opened, and we all filed soberly into a muffled room. We were quiet, partly because the strained stillness of the room affected us into further silence, and partly because most of us who were there for the first time felt we were in the presence of some great unseen, awesome force. The studio is about 20x30 feet, completely lined and draped with cloth and burlap and without windows, so that there will be no echoes and no penetration of sound from the outside.

The draperies are a warm gray. Palms, rose and gold floor lamps, a grand piano, a thick gray velvet carpet, and gay tapestries and cushions make it a very lovely room. One likes to think that the Little Symphony Orchestra plays on a well-set stage. When I go home to the farm again and listen to KDKA I shall always see in the concert a happy group of people in the lamp's rose glow, gathered to give me their best talent.

It seemed to me, as I sat there waiting, that I was about to witness a startling phenomena. I expected at least thunder and lightning to accompany the sending of the concert. I once visited a wireless station where the messages start off with a convincing popping. This would surely be greater!

It is now twenty-nine minutes after seven. The announcer is frantically asking everyone how to pronounce Macheroni, the name of a composer someone is to interpret. He gets a dozen different versions, then makes a run for the dictionary. The announcer takes great pains to see that every word is pronounced with absolute correctness.

At one end of the studio, in a glass box projecting from the wall, flash the words "Set On." This means that the radio is ready any time the speakers are. Two men come in and work with the sending apparatus. One speaks into the microphone, and the other asks over a telephone if everything is in working order.

The microphone looks like a tin can swinging on the end of a fishing pole stuck in the ground at right angles. The "pole" is a mahogany bar of wood. The "can" is neat and black. But one gets the willow-pole-tomato-can idea just the same.

The clock points to seven-thirty. A button is pushed and simultaneously the signal box flashes in large letters "SILENCE" to the microphone and says with emphatic articulation, "You are listening to KDKA, East Pittsburgh, Pennsylvania. The first number on the program will be Schubert's Serenade, played by Mr. Tom Jones." We hear the opening chords by Mr. Jones. That is all there is to see or hear. The program is on. Some family out in Michigan has put on the loud horn and settled down for the evening.

The tenor who is to follow the piano solo is nervous. He has a right to be. He is about to sing to 2,000,000 persons. He never in all his life before has had an audience of more than 800 people. And even though he is an excellent singer his audiences have seldom numbered more than 200 persons. He is a church singer, and has been used to appearing before his own acquaintances and friends, who overlook his mistakes, and who also, by the way, take his excellency for granted. Until now he could fall back upon a smile or a gesture to carry him through. But only the actual merit of his singing will please this vast audience.

The piano solo ended, the announcer signs off, and the signal says to "Stand By." The radio couldn't hear us talk any more. "Don't be afraid. Just put your pep into it," the violinist encourages the tenor.

Until a few months ago she herself was as unknown to anyone outside her home city as is the rose in the desert. Now she gets familiar and favorable mention out in Higginsville, Illinois.

The violinist played with all her heart. She had received many personal letters from all over the United States since her radio debut, and when she tucked her violin under her chin it was to no abstract audience before which she was performing. She played to the bedfast woman who had written to her from Ohio; to the old, old man who had painfully scribbled a thank-you note from West Virginia; to a little crippled boy she had become acquainted with out in Wisconsin; to the men of the Michigan lumber camp who had sent her their appreciation; to the Arkansas farm family who had told her they would be listening in on this night; and to many others near and far. She played better for every letter that had come to her. She has the joy of giving to appreciative people.

Do You Want LONG DISTANCE on Your Set?

The following stations have been heard with a COAST COUPLER

WDAP—Chicago
CFCN—Calgary
WWJ—Detroit
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And Many More

The COAST COUPLER is a necessary part of your radio hook up. Manufactured of the best materials obtainable and thoroughly tested before leaving the factory, it has immediately won recognition in the radio market.

ANYWHERE IN THE UNITED STATES—$5.00

Dealers and Jobbers Investigate

COAST COUPLER COMPANY

245 EAST SEVENTH STREET LONG BEACH, CALIFORNIA

CLARK INDORARIAL

Trade Mark

Indoor aerial—not a loop

Looks like a flat sheet of wall paper metal tipped like a calendar. Put it under carpet or rug or hang it back of closet out of the way—no matter where put this marvelous INDORARIAL works perfectly.

CLARK INDORARIAL POSTPAID ANYWHERE **$1.50**

RADIO WORLD'S technical editor suggests using two INDORARIALS as a set, one as an antenna, the other (two or three feet below it) as a counterpoise in lieu of a ground—"this gave perfect reception."

L. I. CLARK CO.
Manufacturers
52 East 11th Street, New York

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Local representatives wanted in every large city.
Write for particulars to L. I. Clark Co., 52 E. 11th St. New York.

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The long distance detector $5.00

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The ideal dry battery detector $6.50

This one fact reveals at a glance the growth of radio! 3,600,000 RADIOTRONS already sold! It was the perfection of the RADIOTRON that made popularization of radio possible—and every vacuum tube set needs RADIOTRONS for clear reception and amplification—for sensitivity—and long distance reception.

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio and other fields. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get an eight-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands eight days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office eight days before publication. RADIO WORLD, 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

FRENCH COLONIES FREE—Beautiful picture set, including Native Chiefs, Tigers, Pictorials; 2c postage. Empire Stamp Company, 351 Lippincott St., Toronto, Canada.

WESTINGHOUSE R. C. 3 tube set, like new, for sale cheap. O. Lyshang, 6 Althea St., Dorchester, Mass.

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

60,000 MILES ON A HOME-MADE RECEIVER. 2,600-mile range. 100 station log and hook-up for the asking. Maitland Roach, 2908 Columbia Ave., Philadelphia, Penn.

RADIO SET—Extremely sensitive tuner and one step in 8x18 walnut cabinet. I hear Kansas City Star; Omaha, Neb., etc. Atwater Kent parts. Complete with two WD11 tubes and phones, $70 postpaid. Address, Garth Showers, Tannersville, N. Y.

DETECTIVES NEEDED EVERYWHERE—Work home or travel. Experience unnecessary. Write, American Detective System, 1968A Broadway, N. Y.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor, or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, tape or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

150 FUNNY PARODIES on latest songs, 25c. Book catalog, 2c. R. W. Collins Co., 197 Fulton St. Brooklyn, N. Y.

THE AMATEUR ELECTRICIAN explains the "How and Why" of electricity with plans for making and operating wireless, telephones, electric bells, toys, novelties, etc. Over 70 illustrations, 64 pages. Only 10c. R. W. Collins Co., 197 Fulton Street, Brooklyn, N. Y.

EDISON Elements for making "B" Batteries, 6c per pair; tubes, 2c each. Nickel Wire, Insulators and Cabinets at reasonable prices. TODD ELECTRIC CO., 178 Lafayette St., New York City.

ALL ESSENTIAL PARTS FOR building Neutrodyne Receiver, complete instructions, etc., $21.50 C. O. D. Reinartz tuning coils, $1.50. R. Schwartz, Buchanan, Mich.

GET OUR PRICES on Plate and Filament Heating Transformers. L. Werts, 409 St. Julian St., Pekin, Ill.

FOR SALE—De Forest Portable Radiophone Transmitter. 5-watt bulbs; new, $100 net F. O. B. P. O. Box 33, Red Bank, N. J.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Calif

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

WANTED—One K. W. used Navy Quenched Spark Gap. Also Price wanted. Harvard Radio Laboratories, P. O. Box 1781, Boston, Mass.

FOR SALE—Three Radio Corporation, 200 to 5000 meter radio frequency transformers, like new, fine for superhetroydne, $5.00 each. Fine Phonograph attachments, needle operating kind. Guaranteed good as Magnavox, $10.00 each. Any of above sent post paid, collect, on receipt of $1.00. Everything sold on money-back guarantee. RAYMOND MOORE, Box 404, Lakeside, Ohio.

OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

LEARN THE RADIO CODE in 3 hours or less by the Corydon Snyder Code Method. Money back if not satisfied. 50 cents postpaid, or particulars for stamp. Corydon Snyder, 1161 So. Ridgeland Ave., Oak Park, Ill.

MAGNAVOX TYPE R3—Latest curvex, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kan.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

SECOND-HAND Westinghouse R. C. Regenerative receiver, consisting of detector and two-step amplifier, $65.00. Three Erla Radio Frequency Transformers, $6.00; Crosley two-step amplifier, $14.00. All of the above is good as new and will work with all standard bulbs. Address Randolph Whitehand, Albany, Georgia.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

ELEMENTS OF RADIO TELEPHONY

By WILLIAM C. BALLARD, JR.

Assistant Professor of Electrical Engineering, Cornell University

This is a standard book on radio telephony, the work of a recognized authority.

It is accurate, simple, clear, reliable and strictly up to date.

The man with a technical background who wants to post himself on radio will find this exactly the book for his purpose.

The radio enthusiast will find in it an excellent presentation of fundamental principles and their application.

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THE COLUMBIA PRINT, 1493 B'way, New York City

RADIO FANS

Do you want to sell your old set?
Do you want to exchange anything for something?
Do you want to buy something?

If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

Try Radio World's Classified Department for your personal radio and other needs.

RADIO WORLD, 1493 Broadway, New York City

HOOK-UP AND CIRCUIT HOUNDS

Did you miss it? Do you want it? If you do you can get it by writing in to Radio World for any one of these back numbers, as per dates:

Good 2 tube WD-11 Circuit for DX.....Jan. 27
Satterlee Circuit .....Feb. 3
G. W. May's Wonder Circuit.....Feb. 17
Multi-tube Reflex Circuits.....March 3
One tube Superregenerative.....March 3
Lewis Three Tube Circuit .....March 10
Regenerative Radio Frequency Circuit for 5 tubes .....March 24
Hazeltine Neutrodyne Receiver.....March 31
2VK'S Transmitter circuit.....April 21
Compact Universal Receiver.....April 28
Stockelburg Pup receiver.....May 5
Coskaday receiver .....May 12
Improved Grimes Circuit, A. D. Turnbull's Long Distance Circuit, Combined Receiver and Transmitter, Improved 1 tube Rienartz .....May 19

Any number for 15c. Any 7 numbers for $1.00. All 12 numbers for $1.50. Or start subscription with any number. Radio World, 1493 Broadway, New York City.

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Sell Madison "Better-Made" Shirts, Pajamas, and Nightshirts direct from our factory to wearer. Nationally advertised. Easy to sell. Exclusive patterns. Exceptional values. No experience or capital required. Large steady income assured. Entirely new proposition.
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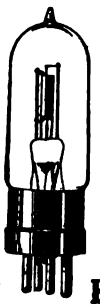

WE REPAIR
RADIO TUBES

WD-11....	$3.50	UV-199...	$3.50
WD-12....	3.50	C-299....	3.50
UV-200....	2.50	UV-201A.	3.75
UV-201....	3.00	C-301A...	3.75
C-300.....	2.50	UV-202...	4.00
C-301.....	3.00	C-302....	4.00

Mail orders solicited and promptly attended to.

H. & H. RADIO CO.
P. O. Box 22-B
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VACUUM TUBES REPAIRED
WD11—WD12—UV201A—UV199—and others for
— $3.00 —
Quick service—All tubes repaired by us guaranteed to work as good as new. Send your dead tubes—we prepay parcel post to you. All you pay is $3.00 to postman. We give 48-hour service.
Thomas Brown Co.
511-517 Orange St. Newark, N. J.
Write Plainly

WD-11 and WD-12
TUBES REPAIRED

WD-11 or WD-12	$3.50
C-300 or UV-200	2.75
C-301 or UV-201	3.00
C-302 or UV-202	3.50
C-301A or UV-201A	3.50
Moorehead Detectors	2.75
Moorehead Amplifiers	3.00
DV-6 or DV-6A	3.00
Also the new UV-199	3.50

All tubes guaranteed to work like new.
Mail Orders Given Prompt Attention
"24 Hour Service"
NEW DX 1½ VOLT TUBES..... $4.00
RADIO TUBE CORP.
55 Halsey Street Newark, N. J.
TUBES SENT PARCEL POST, C. O. D.

SEND NO MONEY
Guaranteed!
Money back if they do not satisfy after
5 DAYS TRIAL

SEND no money! Order by postcard and pay postman on arrival. If they do not excel any other phones you ever used regardless of price, return them and your money will be refunded at once.
AMBASSADOR LONG RANGE PHONES

RADIO WORLD
TELEPHONE, LACKAWANNA 6976
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
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Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

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While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

Station WHN Interferes With Amateurs

Editor, RADIO WORLD:

I hope that station WHN can be persuaded to sign off two or three nights a week at eleven o'clock in order to give "DX" stations a chance to be heard, as you know that a good many out-of-town stations are at 60 meters. It is impossible to hear anything around that wave length until WHN signs off. In the spirit of fairness I think that they should comply with this wish.

I have spoken to over 25 people in my neighborhood about this matter and they all agree with me fully. Trusting that something can be done regarding this,

Sincerely yours,
R. D. EMMERICH.

322 West 100th St.,
New York City.

RADIO WORLD in England

Editor, RADIO WORLD:

Congratulations on the production of such a wonderful periodical. I look forward to getting the latest copy each week with lots of joyous anticipation.

I am a real novice, just being bitten by the bug and am dying to get hold of a circuit suitable for our English broadcasting.

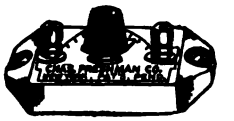
In my opinion we here are miles behind you in radio matters and so, therefore, why should I not have a real American circuit? Unfortunately we are only allowed to use a regenerative hook-up under certain conditions and at certain times. Lucky American fans!

Yours faithfully,
C. HARWOOD KING.

Higher Bebington, Cheshire,

FRESHMAN
Resistance Leaks
The largest and most complete line in the world
our new construction of all types Variable Resistance Leaks produces a product which we can now guarantee indefinitely as being scientifically correct, mechanically perfect and built for unusual durability.

BASE MOUNTING TYPE VARIABLE RESISTANCE LEAKS



Freshman Leaks give an absolute unbroken range of 180 degrees from zero to 5 Megohms.
With either .00025 or .0005 Freshman Condenser $1.00
Without Condenser ..... .75

PANEL MOUNTING TYPE VARIABLE RESISTANCE LEAKS

will bring in stations never heard before. Can be mounted on any panel in a few seconds. When mounted only the knob shows on the panel. The latest and most essential part of an efficient tube set.
With either .00025 or .0005 Freshman Condenser $1.00
Without Condenser ..... .75

FRESHMAN FIX-O

FIXED RESISTANCE LEAKS COMBINATION—4 IN ONE
Freshman Condenser .00025
Leak Mounting
Freshman Resistance Leak
Safe-T Handle
Price Complete **65c**
Separate Leak and Safe-T Handle.....80c.
Separate Condenser and Mounting.....40c.

At your dealers. Otherwise send purchase price and you will be supplied post paid.
Also ask your dealer for our free diagrams of the Flewelling and Neutrodyne Circuits.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 SEVENTH AVE., NEW YORK

Reinartz Coil $1.85
The Improved Basket Weave, Covering All Broadcasting Wavelengths
With each coil we send FREE two large blueprints, picture hookup and panel layout, list of materials, and fully illustrated instructions for construction and operation.
Buy before the fall rush sets in.
We sell all parts required for this wonderfully efficient receiver—panel, coil, condensers, socket, vernier rheostat, variable grid leak, dials, switches, posts, contact points, wire, spaghetti, etc. (no tubes or phones) for only $9.85. Postage additional on all shipments.
Send no money. PAY THE POSTMAN.
All goods shipped Parcel Post C. O. D.
RADIO SURPLUS STORES
HELENA, MONTANA

Rametra CORPORATION
In Stock— All Parts For the ACMEDYNE CIRCUIT
Tuned Radio-Frequency at Its Best
Described in detail by Mr. Lawrence Cockaday in the August "Popular Radio" and recommended by experts in all parts of the country.
Write or call for complete particulars and prices.
Radio & Mechanical Trading Corp.

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Have New Radio Device—Simple, Practical, Proven Worth—Cheaply Made—Large Selling Possibilities—Sell Outright or Royalty Basis.

ADDRESS FOR FULL PARTICULARS

F. P. HALL, 30 Church St., N Y. City

Radio Tubes Repaired

$1.50 $1.50 $1.50

Send old tubes with $1.50 and receive by **return mail** a guaranteed tube. Be sure and state **in your letter** type wanted; **detectors** or **amplifiers.**

New Tubes Cut Prices

Price List of New and Repaired Tubes Free!

Guaranteed A tubes . . . $2.00

RADIO TUBE EXCHANGE

W. H. BRYANT

453 Washington St. Boston, Mass.

German Apparatus Installed in Norway

APPARATUS for the radio station which is to be built at Bergen, Norway, has been received in that country, according to advices to Washington from Consul George N. Ifft, and preliminary tests have assured the government of its efficiency. Because of the failure of an appropriation for duplex apparatus which would enable the transmission of messages both ways simultaneously, and the failure of the plan to establish a telephone line between Bergen and the Rundemanden radio station, the chief use of the new station will be for the transmission of wireless communications to ships at sea.

Actor Builds a Receiving Set

THE company playing "Merton of the Movies" at the Cort Theatre claims to be the only theatrical organization in New York City which has a radiophone receiving set that was assembled by one of the cast. The set was built by Howard Dale, who plays one of the extras in the film studio scenes. Dale was in both the United States Army and Navy during the war—being thereby rather an ambidextrous performer—and won a scholarship for wireless work offered by the Y. M. C. A.

LOOK!

AUDIO FREQUENCY TRANSFORMERS RATIO 3.5-1

Fully Mounted with Formica Top.
Price $2.15 Postpaid. Send for Circular.

L. WERTS

409 St. Julian Street Pekin, Ill.

10c

Brings you our new catalogue and radio information booklet illustrating and describing the Super-Regenerative and other latest and popular circuits. Our technical staff is at the disposal of our customers. Make use of their knowledge. Merchandise shipped immediately on receipt of order.

U. S. Bureau of Standards "Radio Book." Special .....65c.

FREMONT RADIO SALES CO.
227 FULTON STREET, NEW YORK CITY

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it by buying your "B" Batteries freshly tested and passed by our laboratories—sold direct to the consumer at the following low prices—guaranteed in every respect!

	Large	Medium	Small
22½ Volt plain	$1.25	$1.00	$0.70
22½ Volt variable	$1.38	$1.13	$0.75
45 Volt plain	$2.50	$1.75	—
45 Volt variable	$2.75	$2.00	—

Any type of batteries made to order—send money order including postage—or order for C. O. D.

SPECIAL OFFER—We offer our customers a 0—50 standard Voltmeter listed at $2.75 for $1.87 with any order for batteries amounting to $5.00 or over.

ROSENDAL & CO., Chemical Engineers, 2 Stone Street, New York

SUNBEAM

COCKADAY COILS $2.50 A SET

17-Plate Vernier Condenser.....$3.25

PANELS—GRADE A RUBBER

7 x 10.....65c 7 x 12.....80c 7 x 14.....90c
7 x 18.....$1.25 7 x 24.....$1.65

Parts for Neutrodyne set ***Complete line at special prices***

23-Plate Vernier Condenser.....Special, $3.25

Send us your address—Get our Special Weekly Offerings.

SUNBEAM ELECTRIC COMPANY

71 THIRD AVENUE NEW YORK 207 EAST 14TH STREET

New York Prices

DIRECT TO YOU

A Money-Back Guarantee Goes With Everything We Sell

WE SELL ONLY STANDARD PARTS AT LOWEST PRICES

Kohler's DX Coupler	$1.75
Kohler's DX Variometer	1.75
Kohler's DX 11-Plate Condenser	1.25
Kohler's DX 17-Plate Condenser	1.39
Kohler's DX 23-Plate Condenser	1.50
Kohler's DX 43-Plate Condenser	1.69
U. S. L. 23-Plate Vernier Condenser	3.10
U. S. L. 43-Plate Vernier Condenser	3.45
Acme Audio Transformer	4.00
Acme Radio Transformer	4.00
Amertran Audio Transformer	6.25
Kardon Audio Transformer	3.75
All American Transformer	4.25
Baldwin Type C, Single Phones	4.50
Stromberg-Carlson Phones	6.00
Brandes Phones (New Type)	6.00
N. & K. Phones, 6000 ohms	6.50
Ambassador Phones	3.96

Many Other Bargains. Complete Stock. Write for Prices.

Send Money Order or Certified Check and include Postage.

GLOBE RADIO SHOP

115 West 23rd Street New York

Yours Sincerely ***Greenwich Radio Co***

185 GREENWICH STREET NEW YORK, N. Y.

PATHE Moulded Variometers and Couplers. Guaranteed 600 M..... $2.25

PATHE Loud Speaker.....$17.50

GENUINE WESTERN ELECTRIC
VT 1, $5.95 VT 2, $8.00

CROWN TRANSFORMERS, $2.95
Adapted for ALL TUBES. Ratio 5 to 1.

TRADE U.S.L. MARK REG.

CONDENSERS
U. S. L. VERNIER BAKELITE ENDS
17 PLATE $2.95
23 PLATE $3.25
43 PLATE $3.45

SEND MONEY ORDER. INCLUDING POSTAGE—PROMPT AND CAREFUL ATTENTION

Wireless Will Control Future Wars

PROFESSOR A. M. LOW, scientist and inventor, whose work during the World War was highly valued by the British War Inventions Board, contributes a prophetic article to the Fortnightly Review on the sort of warfare that may be expected a hundred years hence. Among the things he expects to play a part in future warfare are:

Jets of water, charged with electricity, to kill horses and men.

Wireless telephony, sight, heat, power and writing.

Wireless control of tanks and airplanes.

Battle plane engines developing wireless power to destroy aircraft within hundreds of yards.

Wireless heat to destroy European regions.

Giant transport airplanes with incredible speed.

Secret war plans ferreted out by wireless telephone and sight, the future war eyes and ears. Propaganda striking terror into every home by means of wireless receivers which will be more common than the telephone today.

FOUR REASONS FOR ADVERTISING IN RADIO WORLD'S FALL BUYERS' NUMBER

1 At four dollars an inch (yearly contractrate) 74,000 radio-buying readers learn of your goods—a greater number of eyes than four dollars can reach in any other radio advertising medium.

2 Radio World gives **quicker results**—i. e., advertising copy received by Thursday p. m. is published and on the news-stands the following Wednesday morning.

3 A Weekly has greater **reader interest**—the Saturday Evening Post, Literary Digest, Iron Age, are Weeklies. Radio World, the big success of radio, is published every week.

4 Advertising is a gamble. Life itself is. A gambler bets his money on past performances. Radio Corporation of America tried out **Radio World,** then gave us a yearly contract. Magnavox tried us for small space thirteen times, and have just renewed for fifty-two times, using pages. The Federal Telephone & Telegraph Company investigated us from every angle for weeks, then gave us a fifty-two consecutive issue order. A four-time trial of Radio World almost invariably ends with a fifty-two time contract at $120 per page net or $4.00 an inch.

DATE OF THIS IMPORTANT ISSUE—OCTOBER 6

(LAST BLACK FORM CLOSES SEPTEMBER 27)

Special service and value to advertisers in Radio World's **FALL BUYERS' NUMBER:** All advertisers who give us copy for quarter page or more space in Radio World's **FALL BUYERS' NUMBER** will, on request, have their announcements appear in **two colors at the price of one**—in case copy is in our hands by September 24.

Write, wire or phone now for special positions

RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

TELEPHONE LACKAWANNA 6976

Special Editorial and Pictorial Features will make this FALL BUYERS' NUMBER of extraordinary interest and value from the reader's standpoint.

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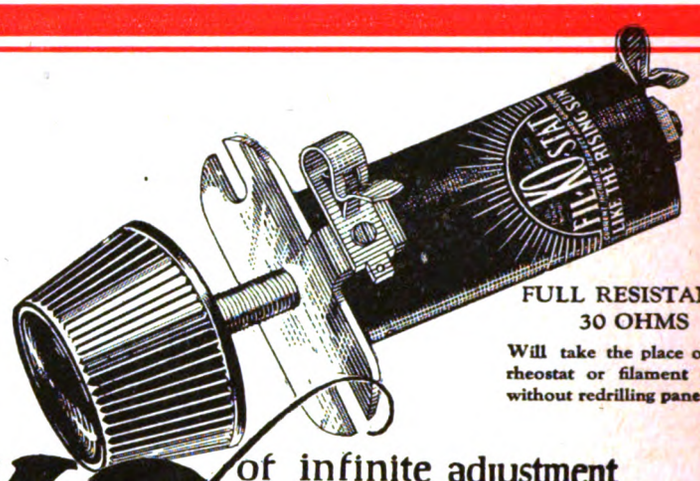
$2

(Price in Canada, $2.75)

Recommended and sold by dealers in high quality radio supplies.



FULL RESISTANCE
30 OHMS

Will take the place of other rheostat or filament control without redrilling panel.

The filament kontrol of infinite adjustment

FIL-KO-STAT

enables you to hear stations you have never heard before and gives absolutely noiseless operation

Missing What You Get

Your set is probably bringing in D X stations you never heard because your rheostat cannot control your filament action. The Filkostat gives infinite adjustment and enables you to *magnify* the weak stations and bring them in strong and clear.

Paul H. Woodruff, Editor Industrial Power, Chicago, writes that after installing the Filkostat he picked up KHJ and KWH, 2000 miles on a single tube regenerative detector.

Eighteen Times More

Laboratory research proves FIL-KO-STAT to have a fine adjustment area (i. e. ability to control filament heat and elextronic flow) eighteen times greater than that of the wire rheostat and several times that of the next best filament control.

FIL-KO-STAT cylindrical design is the outcome of extensive experimentation. It gives the resistance element sufficient radiating surface to eliminate excessive heating. This is one of the outstanding FIL-KO-STAT features.

Adjusted For All Tubes

You have no screws to tamper with on the Filkostat. No adjustments to puzzle you. Experts have taken care of this for you. The Filkostat is not just fabricated. It is a laboratory product triple tested before being sent out and scientifically adjusted to the ideal "off" position for **UV200, 201, 201A, WD11, WD12, UV199, DV6A, W. E. Peanut, *and all other tubes.***

No Wires—No Discs

The makers of the FIL-KO-STAT express their confidence with an unconditional guarantee. Filkostat is assembled by precision craftsmen. It contains a resistance element so finely divided that further resistance is impossible. *There is nothing to break or chip.* When you buy a FIL-KO-STAT you know that you are not only getting the finest filament control made but that, its reliability and durability are fully and completely—

GUARANTEED BY THE MAKER

DX INSTRUMENT CO. HARRISBURG PA

Professional Testimony

The RADIO GUILD writes "comparisons with every reliable filament and current controlling device now available proved Filkostat far superior to all other types of filament controls giving the closest possible adjustment of any type of filament tube and the only instrument which could be used for *all tubes* giving equal critical adjustment at the high resistance as at the low resistance."

Amateur Enthusiasm

Out of hundreds of testimonials, we quote

W. R. Hagedorn, Hay Springs, Neb. — "tried 4 different Rheostats. Filkostat beats them all."

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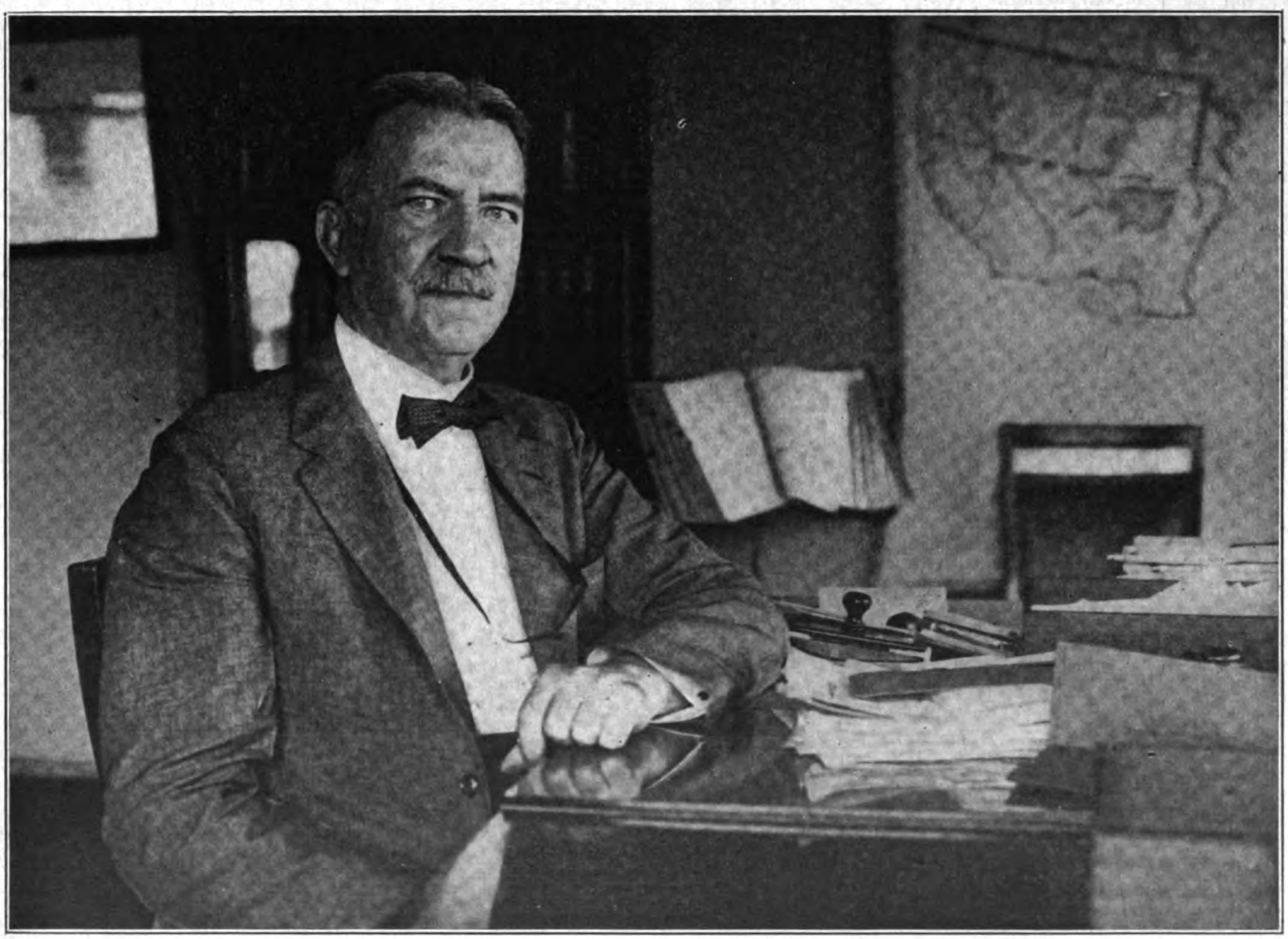

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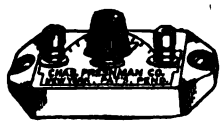
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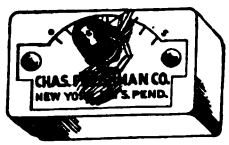
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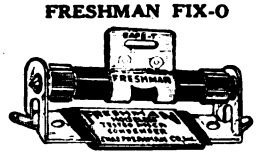
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This Summer Has Shown That Radio Is Not Seasonal

THIS summer has demonstrated that radio is not a seasonal interest and pleasure. It has been commonly supposed that warm weather seriously interfered with reception and this belief has, in the past, lead many to hang up their headphones from May to October.

It is true that static sometimes interferes and that long distance records are not as frequent in summer, but successful reception can be obtained from stations within 500 miles on all but a very few evenings.

Letters received by WGY, the Schenectady, N. Y., broadcasting station of the General Electric Company, indicate that the programs have given real pleasure to vacationists at the shore and in the mountains. The radio public has made the radio set a necessary part of its vacation equipment. It is not unusual, on camp sites, to see the tourist rig up his receiving set soon after the tent is erected for the night. The evening campfire becomes more attractive under the sway of music provided by some distant station. Summer hotels have included radio sets among their attractions and many dances are held to radio music.

Sixty-five Boy Scouts, camping at Stewiacke, Nova Scotia, heard WGY during their two weeks camp, according to a letter recently received at the station. "We are using a homemade set," wrote the camp radio operator, "with two stages of amplification and a loud speaker with no power amplifier. Using this set we are all able to hear, in fact the music may usually be heard a hundred yards around the radio tent. Modulation is extremely good."

Ivan H. Walker, of Ottawa, Canada, wrote WGY complimenting the station on the broadcasting of the play "The Royal Mounted," which came through "clear and distinct." Mr. Walker explained that he was camping with a party. "We have our set with us and are getting excellent results with no interference from others tuning in. All one has to do is to get tuned in and then sit back and enjoy everything."

John P. Badger, a Malone, N. Y., attorney, informs WGY that he moved his radio set to his camp in the Adirondacks, eight miles south of Malone, expecting that he would have trouble in receiving. "However," he explains, "although the aerial is strung among the trees and the ground is full of minerals, your station comes through the loud speaker as clear as a bell."

Italian Broadcasting Soon

AN agreement between a number of Italian radio manufacturers whereby a broadcasting station is to be constructed and put in operation has been announced. Up to the end of July there had not been any regular broadcasting in Italy.

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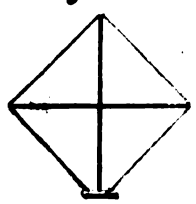
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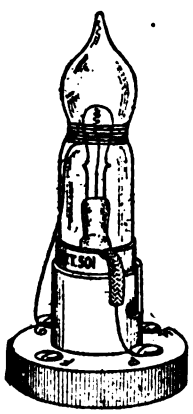
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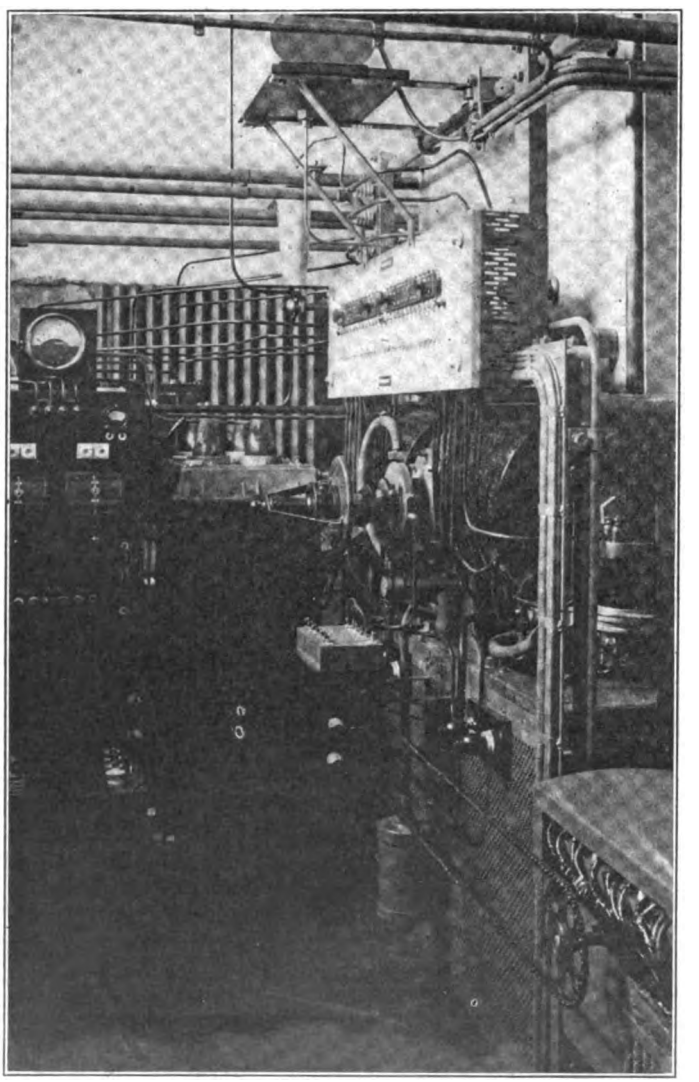
A 10 KW Lorenz-Poulsen Arc Transmitting Station

By Dr. Alfred Gradenwitz

AFTER recently undergoing a number of important improvements, the Königswusterhausen Wireless Station, formerly used for military purposes, has been converted into a big commercial station, operated by the German Postal Department. Of its two Lorenz-Poulsen arc transmitters of 10 KW and 32 KW respectively, it is intended here to describe the former, which may be considered a model installation of its kind, and which under economic conditions enables a thoroughly efficient and reliable permanent service to be maintained. Before proceeding to describe this installation, the fundamental characteristics of an electric arc wave generator may be summed up as follows:

The conversion of continuous current energy into high-frequency current energy is greatly assisted by the electric arc being produced in an atmosphere of hydrogen or some gas containing hydrogen, the great ionic speed of which causes the voltage along the arc to be altered and thus the cathode fall used for heating the negative crater to be reduced. On the other hand, a magnetic field at right angles to the current (or a "magnetic blower" as it is termed) is caused to act on the electric arc, which then constitutes a shifting conductor in a magnetic field of force, the arc being deflected or even blown out entirely. Provision is also made for the electrodes slowly to rotate round their axes, thus enabling fresh portions of these electrodes to be burnt and insuring a uniform consumption of carbons, as well as a constant length of arc.

Inasmuch as the arc current and the magnetic field arranged in series are dependent on one another, arc regulation takes places quite automatically, fluctuations in the electric arc being reduced to a minimum.



Rear view of Lorenz-Poulsen 10 K.W. Transmitter.

Special features adopted in connection with the Königswusterhausen transmitter comprise:

Separate excitation has been adopted side by side with the self-excitation of the magnet coils, thus avoiding any disturbing noises in the arc. Moreover, the positive electrode is a rapidly rotating copper electrode cooled by flowing water, the negative carbon electrode rotating at a slower rate in an opposite direction. A reliable intermediary circuit was inserted with a view to improving the tuning capacity of the transmitter and eliminating upper harmonics. A new wireless telephone method was finally adopted.

The new 10 KW Lorenz-Poulsen transmitter is worked within a wave range of 2,600-9,000 meters at a primary tension of 650 to 800 volts and is connected up to 3,000 c/m. antenna in the case of the shorter waves, and to an 8,000 c/m. antenna in the case of the longer waves. The maximum load on the generator in waves, and to an 8,000 c/m. antenna in the case of the longer

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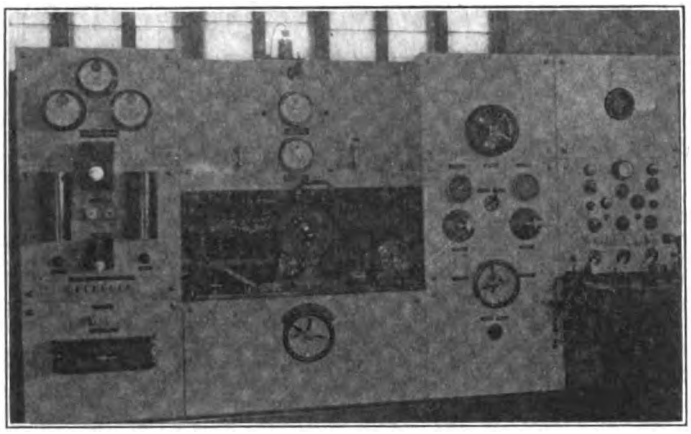
waves. The maximum load on the generator in permanent operation is 50 amperes direct current.

The wave generator, the direct current and high-frequency switches as well as the telephone apparatus are installed on an iron tube frame, comprising four panels.

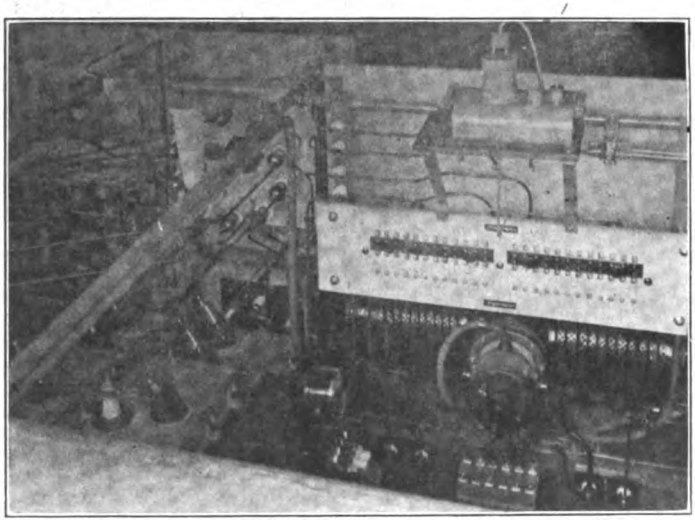
The direct current panel, which in turn consists of



10 K.W. Lorenz-Poulsen telegraph-telephone transmitter.

three marble switchboards, carries on the top the ammeter for the separate excitation of the magnetic field, as well as an ammeter and voltmeter for the current feeding the generator. The central switchboard comprises the block relays, a double-pole switch-out for high tension, and one for low tension, as well as several fuses and rotary switches.

The generator panel is arranged between two marble switchboards, the top one carrying to the left the water-flow controller, and to the right an alcohol controller, as well as two ammeters controlling the intermediary and antenna circuits respectively. A regulating resistance consisting of a resistive band kept together by an asbestos fabric is varied by degrees by



Back of central part and left side of 10 K.W. Lorenz-Poulsen telegraph-telephone transmitter.

means of a large handwheel, and enables the current intensity in the electric arc, and accordingly, the radiated energy, to be altered between its normal figure and one-third its normal figure.

The high-frequency switches are arranged on a similar three-sectioned switchboard, the upper marble switchboard carrying the handwheel for operating the antenna step switch, while the central switchboard comprises tuning apparatus for the antenna and intermediary circuits. A switch enabling a variable coupling to be obtained between the intermediary circuit and the antenna as well as the switch for transmitting with or without the intermediary circuit are provided on the central switchboard. A selective switch for passing from telegraph to telephone operation and vice versa is arranged on the lower switchboard.

The fourth panel likewise comprises three sections, the top one carrying the oscillation controller and the central one the various instruments and handles for operating the telephone apparatus, while a small table carrying on the left the wave controller, is installed immediately in front of the lowermost section.

The Lorenz-Poulsen generator comprises a flame compartment, 12 magnet coils, an alcohol dropper, the cooling device and the ignition. The flame compartment containing the wave generator proper is a metal casing in which the electric arc is burning between two electrodes.

A double-walled water-cooled sleeve disposes of the considerable heat thus produced. The carbon electrode is kept by a carbon-holder surrounded by a sleeve and carried along in its rotation by friction. The magnetic field in the midst of which the electric arc is burning is produced between two iron cores penetrating sideways into the flame compartment. The north pole will be found to be to the right, and the south pole to the left of the looker-on, the current thus flowing away from him, while the electric arc, being a current-carry-

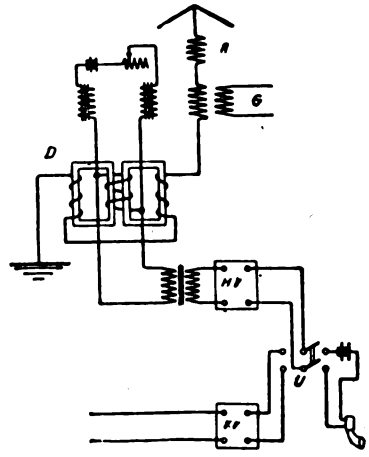


Diagram of Connections Used in Radio Telephony — G, Poulsen high-frequency generator; A, antenna system; D, choking coil referred to in the text and comprising separate iron cores; Hv, two-valve main amplifier which in the case of speech or music immediately striking the microphone is quite sufficent; VV, a one-valve preliminary amplifier inserted in the case of remote action on the microphone; U, a switch for passing from one service to the other.

ing conductor, is blown upward. The cores are made of Swedish ingot iron and are closed magnetically by an iron bow below the flame compartment. Six magnet coils are provided on each of the iron cores. The alcohol dropper supplies the alcohol required for forming a hydrogen atmosphere through an apparatus where the liquid owing to very high temperature is evaporated. The water required for cooling the flame compartment is derived from the water supply.

The electric arc is lighted by pressing the front carbon electrode with the hand against the back one, thus short-circuiting the electrodes. A spring on the carbon holder immediately throws the front electrode back again, thus allowing the electric arc to form. Immediately after lighting the arc, the short-circuit relay for short-circuiting the series resistance of the arc is operated.

The variometers, in conjunction with the transmitter coils, are used for continually bridging the stages provided by the sub-division of the transmitter plant in passing from one wave to the other, and in obtaining an accurate tuning. They are made up of two cylinders rotating within one another, the coils of which are arranged in series, and are placed in an oil bath, to prevent excessive heating.

The transmitter coils (two for the antenna and two for the intermediate circuit) in conjunction with the

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Electrical Imp Plays with Radio Aerials

HARTFORD, Conn.—Electrical imps play strange pranks with the ether, but engineers connected with the local lighting plant have just about given up their search for a particularly vicious specimen which has been annoying broadcast listeners whose aerials are adjacent to a five-mile series lighting line.

A weird sound, described in electrical terms as a "60 cycle roar," pounds into their receivers at the most unfortunate times and even the programs from nearby broadcast stations are tangled up in a boiler factory medley that drives them from the phones. And there is no let-up to the racket.

After complaining to local dealers that their receiving sets were no good, and being assured that they were in first class condition, scores throughout this section appealed to the American Radio Relay League and the local electric light company.

A tiny loop set, operated by officers of the League, revealed the interference as coming from the power line. When the generators were shut down for a few minutes as a test measure, the roaring noise vanished, proving conclusively the source of the trouble.

An examination of the transformers showed them to be in perfect working order and a night investigation revealed no sparking. The "best line in the system" was what the engineers reported, but those who try to hear KDKA through the electrical brass band are not so easily appeased and threaten all sorts of things. A freak line, sure enough, say the listeners while the imp continues to disport with their antennae.

Royalty Listens In

RADIO has been very slow in taking hold, in England, mainly because of the fact that the British Government has put restrictions on it as to what type of receiver should be used, and the conditions under which it could be used.

For that reason, radio has not been as popular in the British domain as it might have been. Even at that, restricted as it is, it has struggled and struggled to the fore until at the present time the British Government has allowed broadcasting stations to be opened and has looked in a more kindly light than formerly upon the "radio listener."

The illustration opposite shows the Duke of Connaught, one of England's royal family, listening in on a Gecophone, an English set, at Bagshot Park, his Surrey home. The set was installed and radio heard for the first time at that particular place. It is not known whether the installation was permanent or not, but if the English "radio bug" bites with the same infective spirit on that side of the water as he does on this, a safe supposition would be that if the installation was merely a demonstration, that it would soon be a permanent one.

Handicapped as our English brothers are in radio, they are making rapid strides. And as they seem to be taking hold in good style, it is hoped that we may soon be able to hear of some revolutionary experiments that have been worked out, as a result of their restrictions.

(C. P. & A. Photos)
The Duke of Connaught listens in through a British receiver.

(*Concluded from preceding page*)

variometers, serve to adjust the wave length, and are connected up in series with the variometers, any wave length betwen 2,600 and 9,000 meters being readily adjusted for by means of convenient sub-divisions.

The radio telephone apparatus is worked on the Pungs-Gerth system of magnetic control of the high-frequency current, which can be used in connection with any continuous wave transmitting scheme. It is based on the following principles: As a coil comprising even a finely-subdivided iron core is traversed by high-frequency current, the amplitude of the latter, on account of losses by hysteresis and eddy currents, is practically reduced to zero, the choke acting like a high resistance inserted into the high-frequency circuit. This damping effect of the iron can be compensated more or less by superimposing a direct current saturating the iron more or less and thus making it less effective magnetically. The high-frequency current can thus be altered within very wide limits by altering the direct current magnetization.

This arrangement enables a very considerable relay effect to be produced, great amounts of high-frequency energy being controlled by comparatively small amounts of direct current energy. The choking coils consists of two cores closed through iron and carrying a common direct current coil as well as two separate high-frequency coils, which are so arranged as not to produce any high-frequency tension in the direct current coil. A standard postoffice microphone responding to 1/100 KW is used, a two-valve or three-valve amplifier being inserted between it and the antenna, to control a nearly one million times higher amount of energy. This arrangement enables both speech and music to be rendered with practically absolute faithfulness, producing the illusion of immediate hearing.

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Radio First to Report the Awful Japanese Catastrophe

By J. L. Bernard

RADIO gave the first news to a shocked world of the appalling destruction by earthquake and fire in Tokio and Yokahama and other Japanese cities, which began on September 1, and continued for several days.

As an island empire Japan had depended, principally until very recently, on cable communication for quick connection with the outside world. The repeated earthquake shocks, which launched one of the greatest catastrophes in history, not only destroyed the shore ends of several cables with their receiving instruments, but also through the upheaval of the ocean floor, probably severed the cables.

Thus was the disaster-stricken territory cut off from informing the world of its frightful plight—except for one means of communication.

By an act of Divine Providence the big radio station, its masts and equipment at Tamioka, 144 miles from Tokio, was spared intact.

The operator on duty at the Tamioka station, whose name is given in press dispatches as T. Yonemura, saw the fleeing refugees pouring past his post several hours after the first earthquake shock. Quick inquiry developed the startling news from the panic-stricken people and then Yonemura put a message on the air which was to startle and stun the world.

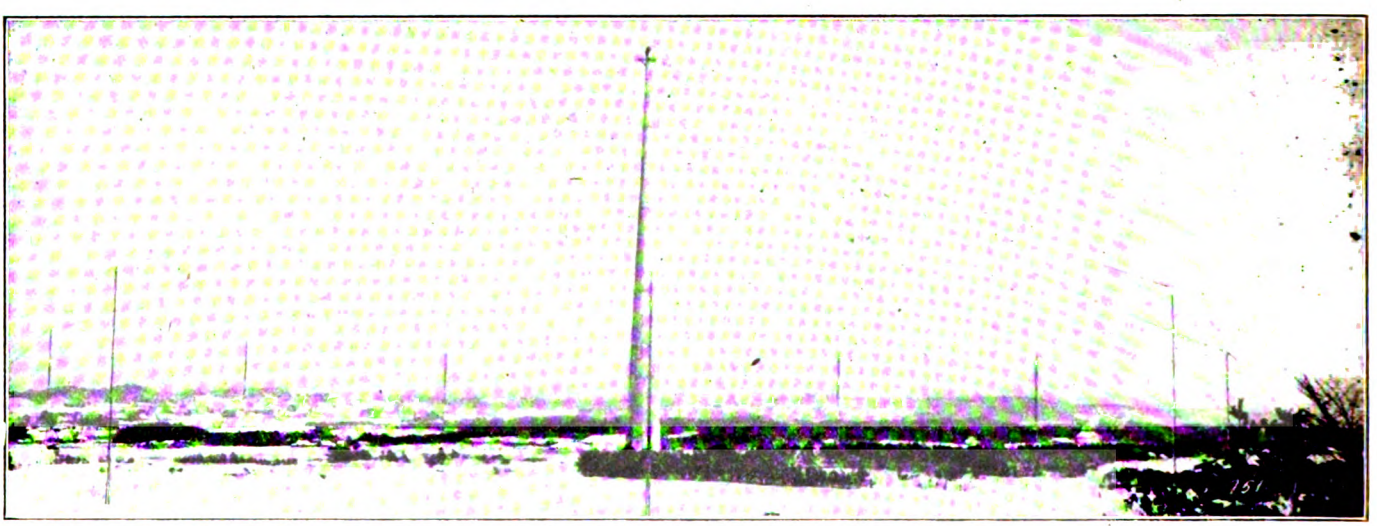
The San Francisco station of the Radio Corporation of America picked up the message first, relayed it instantly to the Associated Press which gave it universal currency through the daily newspapers.

Thus did radio play its vital part in giving the world news which necessitated relief measures on a tremendous scale which might otherwise have been delayed for days.

Locally, in Japan, radio stations have since been the only means of communication with the stricken cities. A number of naval vessels and merchant ships have been assigned posts at various ports to act as relay stations in getting radio messages to and from the disaster-stricken area.

The President of the United States has turned loose every government agency to aid in relief work, all red tape has been cut, the American Red Cross is raising a fund of $5,000,000 to aid the homeless and the hurt, and foreign governments are cooperating in all measures.

The lives that have been saved by radio in this one instance can never be counted, but they must number many thousands.—Editor RADIO WORLD.



View of the radio station at Haranomachi, Japan, showing the reinforced concrete tower 660 feet high. This is surrounded by a ring of 36 250-foot wooden masts on a radius of 1,300 feet from the concrete tower which is 60 feet in diameter at the base and 14 feet in diameter at the top. The station buildings are just to the left of the tower. This is the receiving unit, the transmitting unit being at Tamioka, which is remotely controlled by the operators at Haranomachi. The Japanese consider both these units as one station, known as the Iwaki radio plant. Neither station was affected by the earthquakes.

RADIO communication once again has demonstrated in the eyes of the world how indispensable an institution it has become in serving mankind during great emergencies.

It was radio that flashed across the Pacific first news of the horrible disaster visited upon the people of Japan when earthquake and fire laid ruin two of the principal cities—Tokio and Yokohama.

When the first shock was felt and fires set the cities ablaze the powerful transmitting station at Haranomachi established communication with the high power station of the Radio Corporation of America at San Francisco and at six ten A. M. Saturday the meager details of the catastrophe, as they were received at the corporation station, were delivered at once to the Associated, International and United Press. The violence of the earthquake soon after crippled the telegraph lines which link Tokio and Yokohama. Thus, the only channels of direct communication with San Francisco, the radio system, was isolated from the scene of the disaster until a swift courier system could be established. During these most severe disturbances in Tokio and Yokohama, however, the radio link between the two mighty stations separated by the vast expanse of the Pacific maintained constant communication with each other. Respecting neither the tremendous quaking of the earth, the swelling of the seas which swallowed many of the vessels in Japanese waters or the raging fires that consumed thousands of dwellings, radio waves laden with precious messages continued on their ethereal path.

(Continued on next page)

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The Radio Woman

FRIEND HUSBAND (who is always very useful around the first of the month for paying the bills) took a notion into his head last week to look over the receipted bills for the electric light for the past year. I had already done that several times, and noted the increase over what we had been paying. "Look here," he said after about a half hour's perusal of said bills. "Last year at this time our bills for light were just about one-third of what we are paying now. How come, lady? We haven't had nearly as many parties as we used to have." "Well," I retorted, "you insist on staying up till all hours of the morning listening in, and keeping the lights going. And then there is also that charger that you keep going three nights a week. But at the same time contrast the expenses you used to have for theatre and suppers and the money you lost playing bridge." I took my life in my hands when I made the last remark, because he is very touchy about his bridge playing. "Well, I guess you are right. Theatre tickets every week do amount to a little bit at the end of the month, especially when contrasted with a measly raise of $5 for lights." I would like to make a graph of the raise in lighting bills of those who have radio sets and compare it with a similar graph of the money that they saved by having a radio set. I think it would make interesting data for all persons concerned, don't you?

* * *

A friend of ours who has a wonderful house way out in north Jersey recently dropped in to see us, and, of course, we talked over old times. Naturally we drifted around to the present day radio craze. "Oh, my goodness, I do not know what I would do without radio! It really is too far to go to the country club every evening and the usual rounds of house to house parties are so tiresome. We are so far from town that whenever we decide to come down we decide to make a week end of it. With radio, we can keep right up to the second in everything and besides I think that Joe has shown me more attention evenings since we put it in." Well, that is what they all say, and I know that if broadcasting was to stop tomorrow that it would hurt more people than you could shake a stick at, because people have come to rely upon radio so much for entertainment and relaxation after a hard day that the world would seem to be an empty place without it.

(*Concluded from preceding page*)

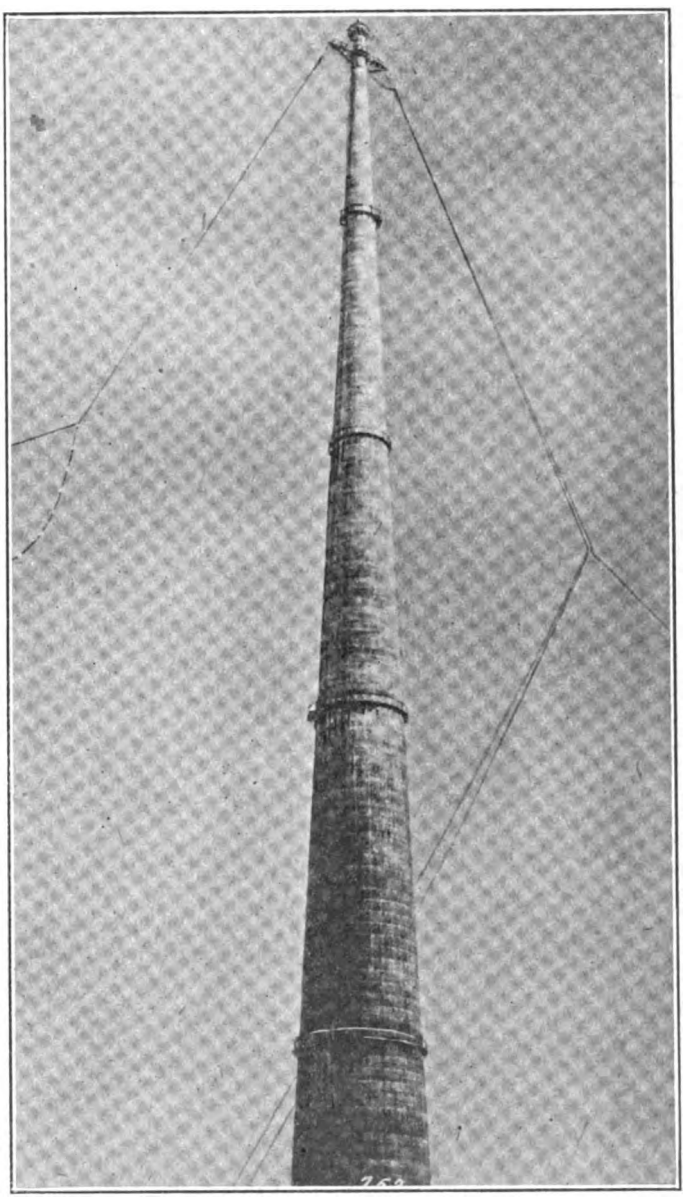
From the very beginning the superintendent of the Japanese radio station, Yonemura, and the operating staff under him labored heroically in dispatching with the utmost speed all messages that reached the station from the station in the interior. Yonemura not only supervised the operators at his station, but was unexpectedly called into service as a translator of the messages which were sent over the radio circuit to and from Japan.

It was perhaps by some strange freak that the Japanese radio station did not suffer damage. Fear was expressed that the giant concrete mast, rising to 660 feet and which supports the antenna at the station, might be rocked by the earthquake and shattered into bits. Fortunately, however, it weathered the test, perhaps due to its exceptional construction, which combines both steel and concrete.

Although the telegraphic facilities from the Japanese radio station to Tokio and Yokohama have been completely wiped out, service to other points inland is still intact. It is highly probable that Japanese engineers are sparing no effort to restore the more important telegraph lines feeding inland from the radio plant.

Since the military branch of the Japanese government is actively promoting internal radio telegraphic service, it is quite possible that an emergency radio relay system will be set up in the devastated regions for communication with the big station near the coast.

The largest radio station in Japan which communicates with the United States consists of a receiving unit at Tomioka and a transmitting set at Haranomachi. The distances betwen Tokio, Tomioka and Haranomachi are 155 and 178 miles respectively. The equipment used at the Japanese receiving station is essentially the same as that used at Riverhead, Long Island, by the Radio Corporation of America, and was



Close-up view of the reinforced concrete tower at the Haranomachi, Japan, radio station, pictured on the preceding page. This station is 178 miles from Tokio. It was probably outside the sphere of influence of the earthquakes, which accounts for its survival intact.

supplied by that company to the Japanese Government. The well known "wave" antenna, which is nine miles in length, is employed for reception on 16,300 meters. The transmitting station utilizes a 500 kilowatt arc set for communication on 14,350 meters. It was erected in 1921 and surpasses in power all radio stations on the island. This transmitter is controlled from the receiving station at Tomioka by a system of land wires which were not severed by the earthquake. The Japanese radio authorities consider both the transmitting and receiving set as a unit which is known as the Iwaki plant.

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Plans for World Radio Expansion

An Interview with General James G. Harbord

JUST returned from a trip to Europe, where he attended the consortium of international radio companies, General James G. Harbord, President of the Radio Corporation of America has authorized RADIO WORLD to publish the following interview dealing with various world radio projects.

The countries represented at this conference in London last month were the United States, Great Britain, France and Germany, and the chief object of the sessions was to complete plans for a projected radio communication service connecting both the United States and Europe directly with South America.

"These plans," said General Harbord, "previously conceived to link the United States and European countries directly with Brazil and the Argentine were enlarged upon at the recent conference. Circuits will extend from the high power station at St. Asise, France; Nauen, Germany, and Carnavon, Wales, direct to Buenos Aires, while the other will bridge the gap between New York City and Buenos Aires through the intermediary of Radio Central, the Radio Corporation of America station on Long Island. The definite intentions manifested by the American, English, French and German radio interests (better known as the AEFG group) at the recent meetings to go forward with the plans which were agreed upon are sufficient proof that the huge program will be brought to a speedy conclusion.

"Reception in Argentina from France and the United States has already been established and the receiving apparatus has been in test operation at Buenos Aires for a number of months. A notable test of this 6,000-mile circuit occurred when the returns of the recent Firpo-Willard boxing contest were transmitted from the giant station at Rocky Point, Long Island, direct to the receiving station at Buenos Aires from which they were subsequently broadcast by radio telephone on a short wave length. Having thus accomplished reception in the Argentine," continued General Harbord, "we are now finishing the erection of a high power transmitting station at that point, which, when completed, will enable us to carry on two-way communications. It is expected that the new service will be ready for commercial use some time this fall.

"It should be of interest to American business to know that a keen sense of appreciation is being evidenced in these developments by business men in South America whose trade intercourse with the United States and foreign countries will be materially enhanced by the establishment of this direct and swift communication service."

When asked about the status of radio broadcasting across the seas, General Harbord had this to say:

"I feel that Americans generally do not appreciate the great strides we have made in radio broadcasting in this country. Certainly the initiative and enterprise which American manufacturers have shown so far have placed this country far in advance of others in this new art. And the great privilege of free broadcasting exists nowhere as we know it in the United States.

"During my visit in France I had the opportunity to manipulate a French broadcast receiver and listen-in to a program broadcast from the Eiffel Tower. The complicated apparatus used for this reception was a striking contrast to the efficient receivers of simplified control that we have in this country at present.

"It will be of interest to note, however, that France is using her high power radio station at Bordeaux to broadcast daily telegraphic press reports which are received by telegraphers at many distant points. So effective is this transmission that press of the day is frequently picked up by a station at Saigon, in Indo-China, some 6,000 miles distant, as well as at Buenos Aires, over 8,000 miles from Bordeaux."

When asked if he wished to interpret the recent radio developments between his company and the Chinese Government in the light of their meaning to America, General Harbord said: "Perhaps we had better begin at the start of these negotiations back in 1921, when the Chinese Government granted the Federal Telegraph Company an independent contract to erect five radio stations in various provinces of China for communication with America. Since that time, the Federal Telegraph Company of Delaware has been formed which incorporates the Chinese radio interests of the Federal Telegraph Company and the Radio Corporation of America, and in which the two American companies will participate jointly under the assignment of the 1921 contract recently approved by China.

"This undertaking calls for the erection of five powerful stations in China, the principal one to be located at Shanghai. This station will engage in direct communication with the RCA stations at Hawaii and even San Francisco, over 5,000 miles distant. Shanghai will also operate a station of lesser power for communication with similar smaller stations to be located at Pekin, Canton and Harbin, each of which cities are separated by approximately 800 miles. In this way the central station of Shanghai will have 'feeder' stations in the principal provinces, through which traffic from these several territories will be routed to the giant station at Shanghai, for transmission to the western hemisphere. Conversely, Shanghai will be the gateway through which communications from points East will pass to the Chinese interior. These stations will be operated jointly by the Federal Telegraph Company of Delaware and the Chinese Government, thus placing the project under Chinese-American administration.

"The confidence of the Chinese Government, in entering into active participation in this program was enhanced largely as a result of the limitation of armament conference held at Washington, D. C., in the fall of 1921.

"There are no exclusive or monopolistic features in this contract," continued the General, "and from the very inception of negotiations the project has had the wholehearted support of the State Department at Washington, who view the recent completion of plans as a signal accomplishment in international diplomacy.

"American business men will be quick to appreciate the commercial significance of this comprehensive plan, inasmuch as there is today only one cable crossing the Pacific to China. And this new, strong link of friendship cannot help but play its own important part in the cause of better understanding between these two countries, and indirectly the peoples of the world."

General Harbord was recently elected President of the China Society, an institution for the promotion of Chinese interests in this country. For this reason, he has a special interest in the contract, from the standpoint of the far reaching business and social influence of the Society.

Work on the stations will begin this fall, and the inauguration of service is expected during the latter part of 1925, although the plan may reach maturity before the time. Test signals will span the Pacific from China well in advance of the official opening, however. A moment spent in glancing at a map of the world reveals that today, although commercial radio is scarcely three years old, we are enveloping the entire globe with radio waves. A further calculation shows that the actual daily transmission range of the high power radio circuits which terminate in the United States totals over 41,000 miles.

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A Selective Tuner at a Reasonable Cost

By C. White, Consulting Engineer

THE daily cry is for more selectivity. With the carefully designed modern receivers distance can be easily covered but it is often quite hard to master interference under all conditions. Many amateurs who have built their own single circuit tuners are troubled quite a good deal by interference and jamming. This jamming is noticeable as whistles, groans, and a most varied assortment of howls accompany distant reception. We are apt to blame a good deal of this noise on our neighbors, who operate similar sets and are not well acquainted with tuning to prevent their set from oscillating and awakening the so-called "birdies." To those who already operate a single circuit tuner and do not wish to go to any great expense to change the same I would recommend that they purchase a variable grid leak and a good wave-trap.

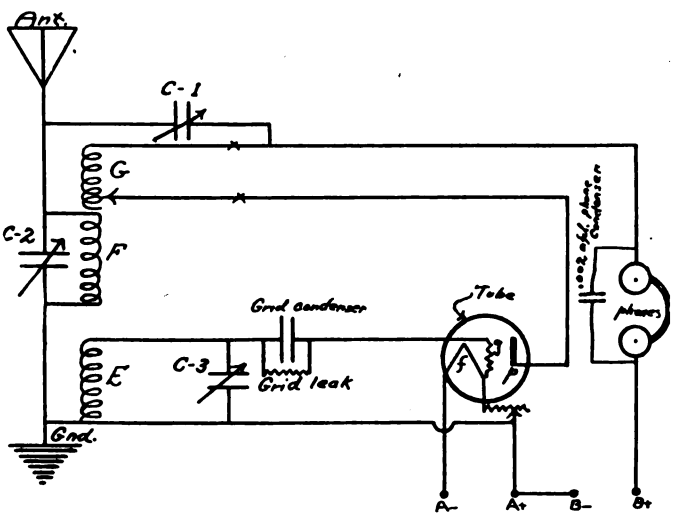
Critical and sharp tuning is quite easily accomplished with this new style of tuner, and still the chief disadvantage of some of the present selective regenerative tuners is completely removed. It is most desirable in tuning in that a receiver should tune rather broad to let you get the range of the station and then be capable of getting more critical adjustment afterwards. With most variable coupling tuners this is readily accomplished by the expert tuner but rather difficult for the average fan to use with success.

Therefore, in this new receiver I have made the coupling fixed and by correct prescribed manipulation of the three variable condensers any degree of regeneration and sharpness of tuning can be had. For instance, let us assume you are endeavoring to pick up a certain station but you do not know exactly where it comes in on the dials. Then you would set the condensers C-1 and C-2 so that they would have a minimum amount of capacity, that is, the dials should read zero if they are correctly set on the condenser shafts. Now the station can be picked up if its signal is of fair strength by adjusting the secondary tuning condenser C-3. If no results are obtained then C-1 can be given greater capacity which will allow more regeneration and the tuning of C-3 can be repeated. It is generally possible to use the condenser C-1 to hold the tube on the point of oscillating by manipulating C-3 and C-1 at the same time.

After the signal has been picked up then the condenser C-2 will come into play. This condenser is used to make the signals much sharper. But as C-2 is tuned in then the capacity of the condenser C-1 will have to be reduced in order to prevent the tube from "spilling over." This is necessary because as the circuit formed by the coil F and the condenser C-2 become tuned to the same wavelength as the circuit E and C-3 the electrical coupling between the coils E and G will be increased very strongly, which means more feed-back action or regeneration. The taps on the coil G will also afford another method to control this amount of regeneration both in the preliminary and final tuning methods. It is plain to see that there are many ways of tuning in this outfit, hence affording plenty of room for experimentation. I personally would not have a receiver that would not allow flexibility in tuning, because you can always have an alternative when the signal is weak with one adjustment to try one of the other combinations of controls.

The constants for the receiver are as follows: The condensers C-1, C-2, and C-3 are each 11 plate variable condensers, although it is preferable to have some sort of vernier adjustment on the condenser C-3 to get exceeding fine adjustment on all wavelengths. The grid leak and the grid leak condenser should be of the correct size recommended by the tube manufacturer, but it is being proven that a variable grid leak resistance is just the thing to use since it affords many critical adjustments. If you are just building your first receiver it would not be a bad idea to purchase a variable leak having the correct ranges and a fixed grid leak. Try both and note the difference between the variable leak adjusted to a certain value and the fixed leak.

A grid leak costs very little at the most compared to the total cost of the receiver, so you might as well get the very best to start with and avoid much of the trouble a bad unit will cause. The next step is to purchase about ten inches of good insulation tubing having a diameter of three and a half inches or thereabouts. All the inductance coils are to be wound with No. 22 S. C. C. magnet wire. The coils E and F each have 60 turns of wire untapped while the coil G has 60 turns tapped for switchpoints at every



A selective tuner easily constructed at home, and at a reasonable cost. Follow the diagram and description exactly in every detail if success is wanted.

fifteenth turn. All the coils should be wound on the same tubing turning the wire in the same direction of rotation, and arranging the sequence of end turn terminals and taps as illustrated. After the tube has been prepared so as to form the complete unit E, F and G, then the surface of the windings can be thinly coated with cement so as to weather proof them and hold them firm. If you cannot obtain cement hot paraffine will serve just as well, but you must take care to scrape off all the excess paraffine.

Of course the general rule of cleanliness in workmanship is paramount in assembling this receiver. Plan your panel layout with precision and care, and make it a point to avoid unusually long connecting wires. After you have built the set try reversing the terminals to the coil G at the points marked X X and note which connection gives you the maximum volume both in the final and the preliminary tuning adjustments. There is one connection that is decidedly better than the other, so you will experience no difficulty in hastily arriving at the correct conclusion. You do not have to shield this receiver unless you care to as an extra refinement. If you do, do not place shielding other than around the vicinity of the three condensers. In order to cut down body capacity see to it that you have the variable condensers connected as recommended. The movable plates or rotors of the condensers C-2 and C-3 should be connected up to the ground side of the circuit while the rotor of C-1 should be connected to the Ant. This receiver will operate well with the new UV199 or C299 tube, affording the correct amount of regenerative control so necessary with a high vacuum tube.

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Adding Audio-Frequency Amplification to the Nite Owl Specials

By J. E. Anderson, M. A.

THE circuits published in RADIO WORLD for July 7 and 21 under the title of Nite Owl Specials have aroused considerable interest, if the number of favorable reports and requests for extensions that have been received are to be taken as an indication. Some trouble with the circuits has also been reported from a number of experimenters, but fortunately the trouble reported by one has just contradicted that reported by another, showing that the difficulty does not reside in the principle of the circuit, but rather with the individual application of it. Some say that the circuit will not oscillate at all, and others that it is impossible to prevent oscillations. A warning was sounded in the original article against trouble of this nature and a remedy suggested. Other suggestions will be given below in connection with the circuits having audio-frequency extensions.

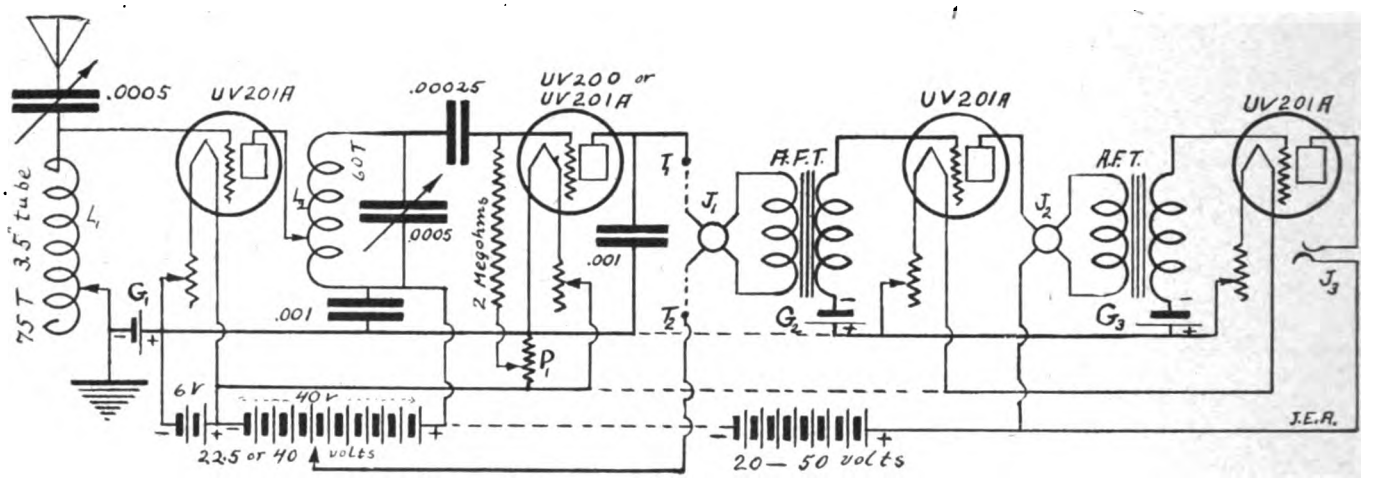

Fig. 1—The original Nite Owl Special with the addition of two stages of audio-frequency. Note the "C" batteries and their position.

Requests have been made for circuit diagrams showing the addition of two stages of audio-frequency amplification to the direct circuit which appeared in RADIO WORLD July 7, and diagrams showing the addition of one stage of audio-frequency amplification to the reflex circuit that appeared July 21. Accordingly, herewith are given the requested circuits, Fig. 1 referring to the direct and Fig. 2 to the reflex.

These two circuits give approximately the same quantity of output, but differ greatly in selectivity. The single circuit, of course, gives greater volume but is not nearly so selective as the other. If desired, the single circuit may be made the reflex and vice versa.

In order to help prospective constructors, all the electrical constants of the various component parts are given. The design of the circuit has been made especially for use with UV201A tubes as amplifiers and either a UV201A or a UV200 tube as detector. If a UV200 tube is used the potentiometer should be connected as shown; if a UV201A is used the lower end of the grid leak may be connected permanently to the positive side of the "A" battery and the potentiometer either dispensed with or used as a stabilizer in the grid circuit of the first, or radio-frequency amplifier, tube. In that case the positive side of the first grid battery should be connected to the sliding contact of the potentiometer instead of to the negative side of the "A" battery. For the UV201A tubes the filament rheostat may be any six ohm rheostat on the market, but for the UV200 it should either be a carbon pile rheostat, or one furnished with vernier adjustment. The grid condenser of the detector is given as .00025 mfd., but it may have any value down to .0001 mfd. It is essential, however, that its insulation be of the highest. Either air or mica dielectric is recommended.

The symbols J_1 and J_2 represent double circuit jacks. These are rather unconventional, but are drawn that way for convenience. J_3 is a single circuit jack for the telephone or the loud speaker. T_1 and T_2 are the telephone terminals of the original circuits. The dotted lines represent the necessary leads to the added audio-frequency amplifier. If the original circuits and the amplifier are built in separate units, the dotted lines would represent the connecting straps from one cabinet to the other.

The "B" battery voltage on the UV200 detector tube may be any value from 16.5 to 22.5 volts. The correct, or optimum, value can best be found experimentally. If a UV201A is used as a detector the plate potential should be 40 volts. The plate voltage on the radio-frequency amplifier tube in Fig. 1 should also be about 40 volts. In Fig. 2 it would be better to use 60 volts on the first tube, although only 40 is shown, in order to prevent distortion of the audio-frequency load on that tube. For the same reason the plate voltage on the other audio-frequency amplifier tubes should not be less than 60 volts and may be as high as 90. Good quality cannot be expected for low plate voltages if the volume of the signal is sufficient to operate a loud speaker.

The proper grid biasing batteries G_1, G_2, G_3 depends entirely on the plate potential. If the plate potential is 40 volts, the proper value of the grid biasing voltage is about 1.5; if the plate potential is 60, the proper grid bias is about three volts; if it is 90, the grid bias is either 4.5 or six. On the first tube in Fig. 1 the question of grid bias is not of much importance, as a deviation from the correct amount merely reduces the amplification; but on the audio-frequency amplifiers it is important, as a deviation not only reduces the amplification, but increases distortion.

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Although these circuits have been designed for use with UV201A, other tubes may be used. UV201 may be used to good advantage if the necessary storage battery for heating the filament is available. Even the dry cell tubes, such as WD11 and UV199, may be used if the output is limited to that which one may listen to with comfort with an ordinary headset. No particular changes need be made in the circuit except in the voltage of the "A" battery. If UV199 tubes are used the voltage of the filament battery should not be greater than three volts. The customary voltage of 4.5 for these tubes requires 30 ohm rheostats, whereas the rheostats in these circuits have only six ohms. However, a resistance of from 10 to 20 ohms may be inserted in series with the battery somewhere in order to get around this difficulty.

If either UV201A or WD11 are used throughout, the total current consumption will be one ampere; if UV199 tubes are used throughout, the current will only be .24; but if UV201 and UV200 are used, the tota! current will be four amperes. Hence for the latter tubes storage batteries will be required, while for all the others it is possible to use only dry cells. For the UV201A and WD11 there should be as many dry cells in parallel as there are tubes in parallel, since the normal discharge current of a dry cell is one-fourth ampere. If a UV200 detector tube is used together with three UV201A the total current will be 1.75 amperes. Hence a storage battery will be required for this combination. The extra volume obtained by virtue of the greater sensitivity as a detector of the UV200 than the UV201A is not worth while in view of the great increase in the heating current.

If oscillations cannot be prevented by means already discussed, it will be necessary to use resistance. The use of the potentiometer has already been suggested for this purpose. A plain resistance of from 100 to 500 ohms may be inserted in series with the grid or plate circuits. If in the grid circuit it should be put near the "A" battery; that is, between the negative of the "A" and the positive of the "C," or grid battery G_1. If in the plate circuit it may be put in series with the plate lead. This, however, is not so good as the other connection. The oscillations may also be stopped by reducing the plate potential or the filament current, or by changing the grid potential of the tube. But these methods are not practical for any of the tubes carrying audio-frequency currents. The use of a potentiometer of about 400 ohms is probably the best for both the circuits given herewith.

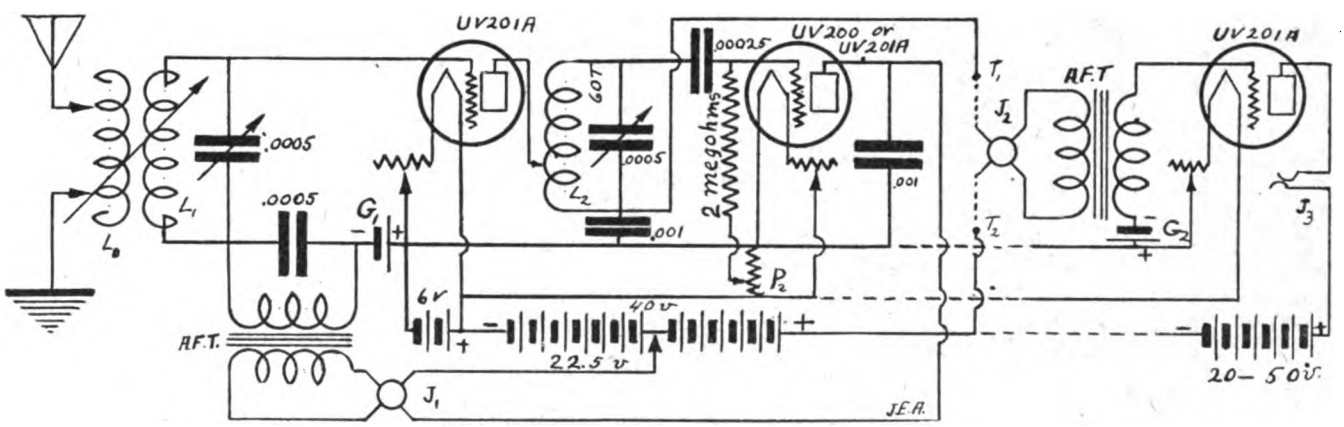

Fig. 2—Improved Nite Owl reflex with the addition of audio-frequency. Extreme care should be taken in the wiring to prevent howling due to intercoupling.

Changes in Broadcasters

ONE new limited commercial broadcasting station was licensed last week:

Call	Station	Class	Frequency Kcys	Wave Length Meters	Power Watts
KUY	Coast Radio Co., El Monte, Cal....	A	1170	256	50

The following limited commercial broadcasting, Class A station, was licensed on June 2, 1923, but was omitted from the weekly list:

KFJB	Marshall Electric Co., Inc., Marshalltown, Iowa..		1210	248	10

Eleven limited commercial broadcasting stations deleted during the month of August, 1923, were as follows:

Call	
	Class "A"
WEAD	Henry Radio & Elect. Supply, Atwood, Kans.
WSAQ	Round Hills Radio Corp., Dartmouth, Mass.
KFIJ	Therean, Sidney I., Platte, S. D.
	Class "B"
WGM	Atlanta Constitution, Atlanta, Ga.
	Class "C"
KGO	Altadena Radio Laboratory, Altadena, Calif.
WRP	Federal Institute of Radio Telegraphy, Camden, N. J.
WJAP	Kelly-Duluth Co., Duluth, Minn.
KGB	Mullin's Elect. Co., Wm. A., Tacoma, Wash.
WLAY	Northern Commercial Co. of Alaska, Fairbanks, Alaska.
WJAK	White Radio Laboratory, Stockdale, Ohio.
WQAY	Gaston Music & Furniture Co., Hastings, Neb.

Use Standard Goods

MANY amateur builders when considering the making of a new set think first of the cut-rate shops where lots of cheap goods can be purchased. They do not consider the protection afforded by a standardized label or carton on the goods they buy. If they would only think of the protection a standard piece of goods made in a large factory, tested and sold at a standard price affords them, they would not buy the cheap apparatus that has no name, or else some funny name closely approximating the real goods.

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RADIO PRIMER—For the New Army of Radio Beginners

By Lynn Brooks

PREPARATION FOR FALL RESUMPTION:—Now that the summer season is practically over and the fans are paying more attention to radio than they did, certain little details will be attended to by the amateur who knows and who expects to get maximum results out of his set.

First and foremost, examine the antenna. Take it down and clean the insulators thoroughly with good soap and water to remove any dust or dirt that may have accumulated through the hot weather. Examine the connections, especially the lead-in, and make sure that it is still making good contact. If there are any splices made in the wire, make sure that they are clean and making perfect electrical contact. If you have not soldered your antenna connections before, now is the time to do it. Scrap the wire and make a sure soldered connection.

Then examine the ground lead and see that it is perfect. Make a thorough job of the inspection and do not simply glance at it. If the ground clamp is fastened to the water pipe it is best to remove the clamp and re-scrape the pipe and the clamp.

The next thing of importance is the renewal of the batteries. Renew your B batteries. On their face they do not show their condition and there is no way they can be tested except by the use of a voltmeter. A 22½ volt battery should not be used when its voltage drops below 15 and a 45 should not be used when its voltage drops below 30. Do not make the mistake of connecting new batteries in the circuit with old ones. The old ones will act as a drag on the new ones, absorb the current from them and seriously hurt their life. Therefore get new ones that have their shelf life marked in plain figures on the side. If storage batteries are used to furnish the current for the plate circuit, keep them thoroughly charged and their plates covered with the solution.

In the case of the storage batteries used for filament current see that the connectors are clean and that a small amount of vaseline is spread lightly over the surface. If the storage battery has been in use more than a year, take it to a service station and have it looked over to determine if it needs cleaning. It probably will and should be cleaned by an expert. Do not attempt it yourself unless you understand storage batteries thoroughly.

The next important thing is cleaning the set itself. Remove the tubes from the sockets, remove all the connections and take the set where there is a good light. Then with a fine brush and a rubber tube blow and brush all the dust out of the corners and rub all the dust off the surface of the apparatus, not forgetting the corners. Do not go about it vigorously, but take it easy and at the same time make sure that you get all the dust and dirt out. Even though the top may be closed all year round, a lot of dust and dirt will accumulate in corners, between wires, and in fact every place in the set that it can. It should be cleaned thoroughly.

The next thing of importance is to see that all your switch arms are making good contact. The points will generally corrode a bit. Go over them with a little wood alcohol on a rag and wipe the surface of all moving contacts with it. Make sure that none gets on any of the apparatus.

Then examine the lugs of your tubes. The little lead nipples should be brightened by lightly passing a piece of emery paper or emery cloth over them. Then examine the contacts on the tube socket and see that they have not lost any of their tension and still press against the tubes.

When you are sure that you have chased all the dirt out of your set, re-hook the batteries, making sure of the connections, and your set is again ready for another winter of DX. This fall house cleaning is important and should be attended to before you have trouble and go hunting. A little care now will save lots of time and trouble later.

DX on Crystal Receivers

By Paul Thorne

THE letter of Philip Keansby, in RADIO WORLD for August 25, again brings up the subject of DX on crystal receivers. Let me settle this question, which seems to rage pro and con without end.

A neighbor and myself conducted experiments along this line recently. He operated a three-tube set, while I used a very good crystal set which I keep as a sort of "life boat" for emergencies. This set has never been able to pick up anything outside of Chicago except WCBD at Zion, which came in very faint.

During this experiment, by pre-arrangement, he would pick up certain distant stations, and I would tune my crystal to that wave length. He picked up a number of stations, the most distant being Troy, N. Y. In every case I heard the concert distinct and loud while he held it tuned in. When he tuned out, I lost all signals.

During this test I particularly noted that I could hear every move he made, my crystal set responding to his tube set just as if my phones had been connected direct to his set. I also noticed that I got the best results when I was tuned to the exact wave length of the station he held.

I consider that this test absolutely settles the whole question. When a crystal owner gets DX, let him inquire among his tube set neighbors, and he will find some one who had the station at the exact moment.

There were many interesting details connected with this test, but I am taking space only to give the results. As we are both well out of the amateur stage and thoroughly understand what we are doing, we are convinced that we have definitely settled this question of whether or not a crystal can get DX and whether or not a tube set transmits to a nearby crystal receiver.

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A Remarkable DX Circuit

By H. S. Potter

THIS seems to be a day and age of new circuits, and everywhere we turn we are stared in the face by radio publications telling, in glaring headlines, of some present-day Marconi who has revolutionized radio by discovering some new principle, which he does not intend to patent, but will give to the world.

I do not claim that the circuit which I am showing here will enable any person who has no knowledge of radio to hear the English broadcasting stations on one bulb, or to fill a room with music from the stations on the West Coast. It is a regenerative circuit and a very good one, the best I have tried for broadcast receptions, as well as being a whiz on short wave C. W.

I hit upon this hook-up while I was experimenting with some of the old favorites. As it was remarkably good, I felt that it was worthy of public attention.

My claims for this circuit are remarkable sensitivity, fine tuning, and entire lack of distortion. As in all regenerative circuits, it is necessary to add two steps of audio-frequency amplification if sufficient volume for a loud speaker is required. On one tube I have found the volume to be slightly greater than on the standard two-variometer and variocoupler set.

I will give all information necessary for building a set from this hook-up, but will omit panel dimensions and layout, as every ian has ideas of his own as to the proper arrangement of his apparatus, and will adapt his panel dimensions to the available location for his set, or to a cabinet easily procurable. As a hit, I would suggest a standard 7"x18"x3/16" Formica panel.

In the sketch, L-1 and L-2 are the primary and secondary, respectively, of a variocoupler. This may be of any good make, having a tapped primary. In selecting a coupler, pick one which is wound with fairly heavy wire, about No. 22 or No. 24, not the ultra compact ones using very fine wire, about No. 28 or No. 30. See that the windings are not thickly coated with shellac or varnish, as this greatly lowers the efficiency of the instrument, due to creating a high distributed capacity. Some gain in efficiency is also obtained by using an instrument having very thin walls to the winding form, but this feature should not be carried out at a sacrifice of rigidity.

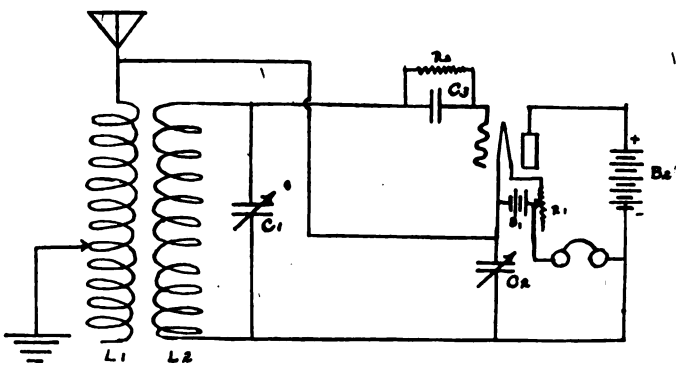
The secondary circuit is tuned by a variable condenser, C-1. This has a maximum capacity of .0005 mfd., which usually means 23 plates, and should be of the built-in vernier type, as the tuning is very sharp.

Condenser C-2 controls regeneration. It is of .001 mfd. capacity, and has about 43 plates. No vernier is required, but a vernier condenser may be used if the builder so desires, and will perhaps help a bit on distant reception.

Right here a word on the selection of variable condensers might be in order. Do not waste time and money on the cheap, worthless pieces of junk sold for 75c to a dollar. A good condenser should have rigidly spaced plates and pigtail connections to the movable plates. There should be enough clearance between plates so that a slight jar will not cause the plates to touch, causing a short circuit. Do not buy a condenser with end plates of moulded "mud," or of dull, cardboard-like fibre, as these compounds usually allow a high leakage. Bakelite, Formica, or Condensite end plates are best, provided metal bearings are provided for the shaft to run in. Be sure the shaft is of standard diameter, as many of the cheap condensers now on the market will not take a dial of standard ¼" bore. As a matter of neatness, it is well to pick condensers whose mounting screws will go under the dial, on the face of the panel. Most of them are built this way at the present time, so this feature should not cause much delay in selecting your instruments.

Little need be said of the grid condenser, C-3, and the leak, R-2. They will have a value of about .0005 mfd. and one megohm, respectively, but this may vary with the type of tube used. R-2 may be made adjustable to advantage. Do not use one of the paper grid condensers, sold for a dime, in position C-3. The only type which is worth while is the mica type, and these are cheap enough to make their use well worth while.

The resistance of the rheostat, R-1, will vary with the type of tube used, as will the voltage of the battery, B-1. The battery, B-2, will be of about 22½ volts for most of the detector tubes now on the market, although it is well to use a tapped B battery, so that the proper voltages may be obtained. On some tubes an even



Circuit diagram of a remarkably selective receiver which is easily controlled and reasonable to construct.

higher voltage than 22½ is an advantage, but this may be determined by experiment on the individual tube in question.

We have, at the present time, a great variety of tubes to choose from. Do not be foolish, and waste time on any of the many unlicensed tubes, or "bootlegs," now on the market, as they are entirely worthless. This includes the many "French" and "Dutch" tubes, most of which are fakes.

Of the good, licensed tubes we have, first of all, the old reliable UV200 or C300. This fits in a standard base, and operates from a six-volt storage battery for filament lighting, with a six-ohm rheostat in series. The main objection to this tube for broadcast reception is the necessity of a bulky storage battery.

Of the dry cell type of tubes, we have the WD11, the WD12, and the UV199. Of these, the first two named have the same electrical characteristics. They operate on one dry cell for filament lighting, and draw .25 ampere. The WD12 is somewhat more desirable, as it fits in a standard six-volt tube socket, while the WD11 requires a special one.

The type UV199 is also a good detector. It has a special base, is the smallest radiotron tube, and is well suited to use in a portable set. This tube operates on three dry cells in series with a 30-ohm rheostat. The voltage drop across the filament is three volts, and the filament current is .06 amperes. Due to its low filament current, a UV199 can be operated from a large three-

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How the Drama Readily Lends Itself to Radio Broadcasting

By Martin P. Rice

Director of Broadcasting, General Electric Company

DRAMA, as a literary form, lends itself at once to radio broadcasting. The actor's finest interpretation of a part is faithfully transmitted to the ears of a great audience without the loss of a syllable or the blurring of an inflection, and under conditions that enable the listeners to concentrate their entire attention on the spoken lines.

Drama, however, carries the inherent suggestion of action, and the question, "How can action be broadcast?" is promptly presented. Before attempting to answer it, we should consider the essentials of dramatic art.

In common with all other fine arts, the drama consists not in a mere reproduction of nature but in an orderly arrangement of certain factors chosen because of their pleasing or appealing qualities. Supplementing these elements in the presentation of dramatic art, stage settings in the modern theatre appear to have reached their maximum development. In fact, it is a question whether they have not in some cases been so heavily emphasized that they overshadow the dramatic interest rather than contribute to it.

The early drama was produced with little or no scenery and without the present-day wealth of costume. The addition of scenery limits the action and at the same time restricts the imagination by confronting it with rigidly defined forms. Perhaps it is on this account that one derives more pleasure from the reading of a Shakespearean drama than from an indifferent performance with elaborate scenery.

In the absence of such conventional forms, the play of the imagination meets no barriers save those erected by the individual's own personality—his own power to comprehend and appreciate. His imagination is capable of unlimited expansion; it envisages the finest subtlety, the deepest sadness, or the highest joy. This fact is recognized by authors who instead of describing a scene or an action in every detail, leave it to be completed by the imagination. Here radio broadcasting enters a dramatic field in which it can attain unique prominence.

Radio drama has the subtle power of staging or suggesting action without being under the necessity of actually reproducing it. So long as there is an ear to hear and an imagination to construct and color, there are no scenic limitations to the radio play and very few as to action. Deftly written lines can carry the listener across the wilderness and overseas, through torrential rains and to the frozen North, into deep mines and on the wings of speeding aircraft. Every mechanical device for imitating sounds is at the disposal of the radio dramatist—the midnight stroke of a great clock, the roar of a waterfall, the moan of wind, and a stealthy step in the dark. Situations impossible of presentation on an actual stage are conjured before the listener's mind in a single phrase.

Small wonder then, that radio is developing an entirely new type of play, almost as free of limitations as is life itself! Small wonder if a new type of actor finds in it opportunity for new forms of artistic expression! Swept of conventional properties and scenery, the radio stage is as wide as the world, as free in its permitted action as the whole range of human experience. If it makes no appeal to the eye, it falls the more intimately on the finer perception of the mind; if it must enlist the imagination, it carries an emotional thrill to which only the imagination can respond.

In all these aspects, the radio drama is a direct contrast to the motion picture, which makes its chief appeal to the eye. The "screened drama" is, of course, devoid of literary form. It is, in essence, merely a sequence of events. While it is capable of reproducing dramatic action very much as the pantomime reproduced it in years gone by, it is in favor today chiefly as a means of visualizing novels or producing plays that have achieved greatness in some other form—of showing events which dramatic art has formerly clothed in literary garb or produced on the stage of the theatre.

We are present at the birth of a new form of literary expression. The radio dramatist, unhampered by the restrictions of the theatre and with an immense audience of sympathetic and attentive listeners, has only to enter his kingdom. The possibilities which have been outlined are alike his opportunity and his inspiration. In the adaptation of existing plays to radio at WGY, the General Electric Company's broadcasting station at Schenectady, N. Y., a torch has been lighted over this new path of literary creation. Here a little company of earnest men and women, wise in stagecraft, are shaping the expression of the new art and establishing its technique. The possibilities of drama and of comedy are being weighed and the results broadcast to the world.

We are only at the beginning of these things, but that beginning is rich in promise—the promise of an art that shall contribute mightily to the cause of culture and more especially to the appreciation of fine dramatic expression.

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cell flashlight battery, if weight and bulk must be reduced, but this is not desirable, as these batteries will not stand up long on continuous duty.

Many an otherwise good tube is a failure, due to the use of a cheap and entirely worthless tube base. All of the very cheap ones have either poor contacts or high leakage between terminals. Get one whose insulating material is Bakelite or Formica, and not of some cheap moulded material, or of low grade fibre.

I am quite sure that any experimenter who tries out this circuit will be well pleased, if he observes a few simple precautions, as mentioned above. Do not use inferior parts, and then blame the circuit if you are disappointed.

Now a word to you fellows who try this circuit: If your results are exceptionally good, won't you help the game along by letting the gang know of it, through the columns of RADIO WORLD? Go to it, men, and the best of luck!

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An Easily Built Super-Regenerative Set

By Byrt C. Caldwell

THE great majority of the radio public has kept away from the super-regenerative circuit as though it was a circuit for only Marconis and Armstrongs to experiment with. No impression could be further from the truth. Amateurs and broadcast fans by the hundreds have proven that if reasonable care and judgment is used in the selection of instruments, and in the building of the set, little trouble will be encountered. The super-regenerative set should really be adopted by

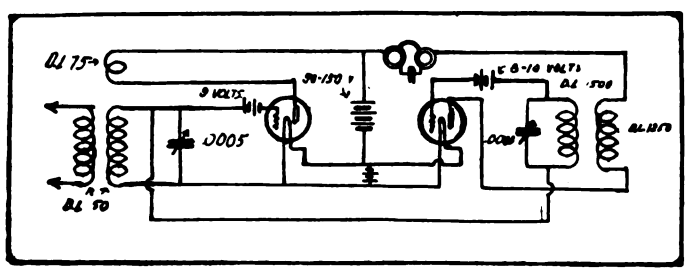

Fig. 1. Circuit diagram of an easily constructed super-regenerative set.

more. It is the nearest towards the ideal that any circuit has reached, with the possible exception of the reflex. The super is easier to construct and adjust than is the reflex, and more miles per dollar are obtained with this circuit than with any other. When this set is used with a loop, results equaling a multi-tube regenerative set which uses an outdoor antenna, are obtained and for the reason that a loop is used, radiation is reduced to a minimum.

The diagrams illustrate a two-tube super-regenerative set that was built by the writer. There is less work required to make this set than there is to make a plain regenerative set with one step of amplification.

The diagram shows the arrangement of the instruments. In making this set, all that is required besides the single tube plain regenerative apparatus, is an extra tube, grid batteries, a variable condenser, and the two large inductances. In looking over the diagram, you will see that the set is really very simple.

Honeycomb or duo-lateral coils were used throughout for inductance. The primary is a 50 turn coil, the secondary 50, and the tickler 75. The grid coil is 1500 turns, and the plate coil contains 1250. They are arranged at opposite ends of the base and at right angles to each other. The variable condensers were of the two plate mica-dielectric type. One of them is inverted so as to make room for the tubes, which are placed between them, with the plate of one tube at right angles to the plate of the other. They must both be hard tubes. The new 201A tubes are as good as can be obtained. The grid batteries consist of several three volt flashlight batteries connected in series, the voltage for the first tube being 9, and for the second, 8 to 10. They should be placed on the base as close to the tubes as possible.

The plate battery, for successful operation, must have a high voltage, 90 to 150 being about right. The higher the voltage, the better the results, within certain limits.

The arrangement of the apparatus shown is the best possible for maximum results.

In wiring the set, use bus wire, or other large copper wire, and be sure to solder every connection thoroughly.

No rheostats are used, and this obviously lowers the number of controls and simplifies the operation of the set.

The operation of the receiver seems to have been the reason that the super-regenerative was not taken up. It is really an extremely simple matter to tune the set if you use a little common sense. You will never get results by just twirling the dials aimlessly. The proper method is as follows: After the filaments are lit, there should be a whistle audible in the phones. If this is not present, vary the grid battery of the second tube, and the second condenser, until this whistle is heard. This shows that the second tube is oscillating. After the whistle is heard, adjust the tickler coil and the first condenser to make the first tube oscillate. You can tell when this occurs, by touching the antenna binding post. A loud click will be heard if the tube is oscillating. After both tubes are oscillating, tune the stations in with the first condenser, and

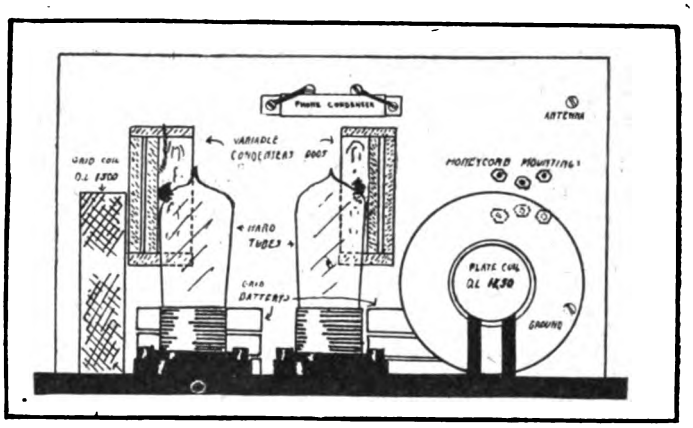

Fig. 2. Suggested location of instruments for efficiency in wiring.

with the honeycomb coils. Then vary the second condenser until maximum amplification without the whistle is obtained.

If a loop is used, it should consist of about 100′ of insulated wire spaced ¼″ between turns and wound on 2′ or 3′ loop.

This receiver will give wonderful results and for the person who is looking for the greatest distance this set is just the thing.

Radio Progress in France

WIRELESS telephony is making marked progress in western France where, through the efforts of dealers, the demand for installations is increasing every month, Consul Fisher reports from Nantes.

Evening concerts are given in Paris by two radio companies and the latest commercial, financial and sporting news is broadcast for interested fans. Cafes, hotels and country homes outside the city limits are said to be especially interested in securing receiving sets.

At Nantes, situated about 250 miles from Paris, most of the receiving stations are equipped with four to six tubes—one high frequency, one detector and two low frequencies, or as Americans would describe it, one radio-frequency, one detector, and two audio-frequency tubes. Double wire antenna about 131 feet long and raised about 23 feet from the ground are popular. Most of the apparatus is of French manufacture, the cost averaging 1,600 francs or approximately $150.

Government taxes on transmitting stations run from 100 francs per year up.

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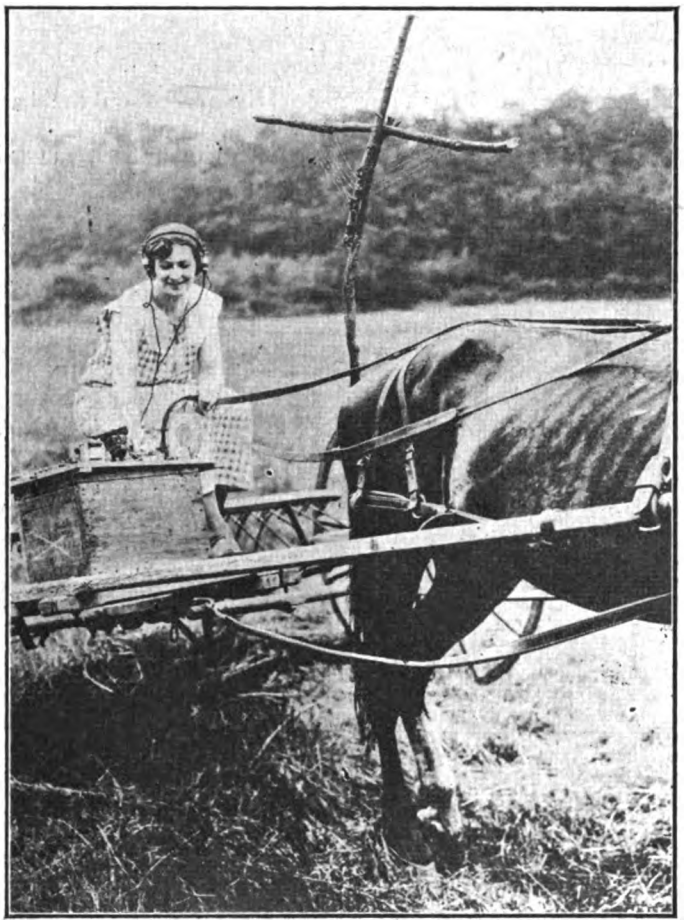
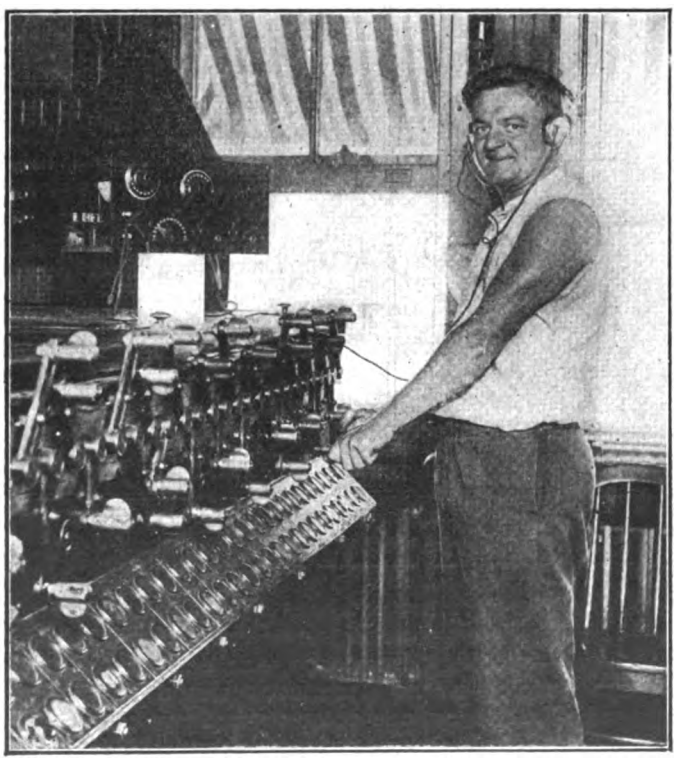
Radio News Pictures Come Piling In—H



(C. Gilliams Service)

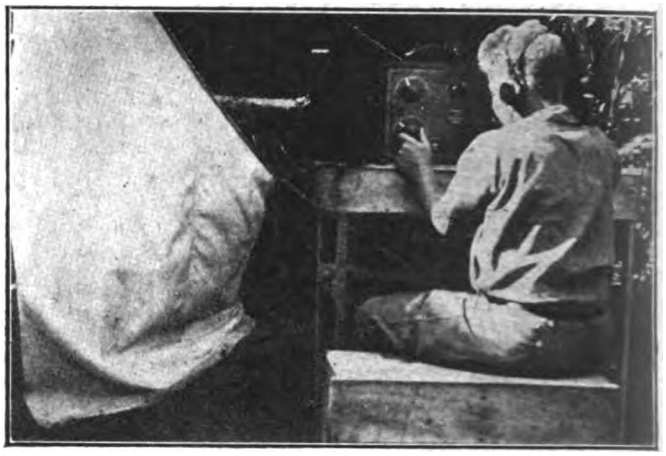
Making hay while the sun shines is not a rite for the farmer alone these days. Mrs. Holt Ramsey, while on her vacation, thought it would be great fun to rake hay if it were not so lonesome. So the farmer's son hooked up a "rustic radio," and now Mrs. Ramsey can make hay while listening to the radio play.



(C. Kadel and Herbert)

Edward Jonckin, signal tower man at the 179th Street elevated station, New York City, has installed the radio set seen over the switchboard and listens in while switching the trains around the tracks. He claims that there is no interference at all due to the trains and high voltage lines, and during the wee hours of the morning when the trains run on half-hour schedule he just clamps on the old "ear muffs" and pulls 'em to the distraction of his mates, who have to while away the weary hours "lookin' sharp."

Most Popular Scout in Camp



(C. Kadel and Herbert)

OF course every Boy Scout camp this summer had at least one radio receiver, and the owner of such apparatus was sure to be the most popular scout, especially when there was a good program on. As the camps were scattered far from the touch of daily newspapers, where the baseball scores and other big games were held, it was always possible to keep right in touch with the sport through the daily broadcasting of the scores.

The illustration shows one of the lucky ones tuning in on his Radiola. Portable sets of this type have probably done more to keep the interest of the average broadcast listener alive during the summer months than any other agency. The fact that they operate on dry cells, take up small space and do not weigh much make it possible to take them anywhere you go. They are rugged and stand traveling well.

The portable sets function just as well as the old-time, cumbersome, storage battery sets, and you have the advantage of knowing that you can always have your radio set with you. The "old-timers" will remember the sets in vogue six or eight years ago when the amateur who had the most "junk" spread over the largest amount of table space and the most complicated switching devices was always considered to be the "real experimenter." Contrast it with the three and five tube sets of today, that copy anything from New York to San Francisco and yet can easily be carried any place you go.

(C. Kadel and Herbert)

Up to the present time radio has never been considered as an instrument of beauty, but rather as a useful instrument to while away the weary hours, or words to that effect. Now along comes Miss Jean Tolley, who has decked out her receiver in ribbons of bright hue and carefully plaited them around her loud speaker, so that they will harmonize with her negligees and boudoir.

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lere's A Fresh Lot

Captions by Robert L. Dougherty

Broadcasting Broadway Hits

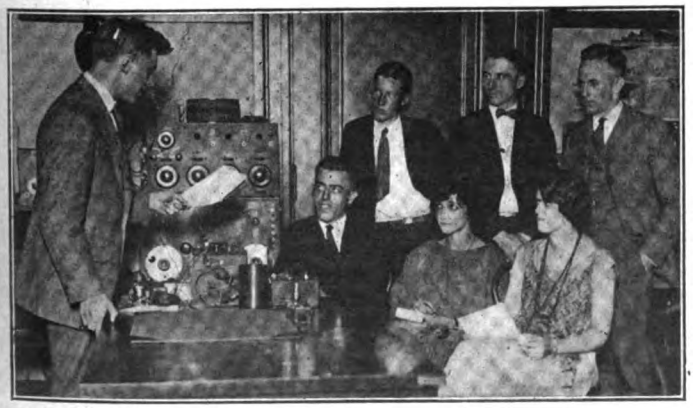
AFTER a few experiments in the broadcasting of popular hits the producers of plays and the broadcasters found such a demand for this type of entertainment that it is done whenever possible.

Of course, the listeners have to have a good imagination to even get a faint idea of what is transpiring at the studio, so, therefore, we are going to let you have a peek "behind the scenes" at a broadcasting station during the performance.

The illustration shows the entertainers of Will Morrissey's "Newcomers," recently broadcast from Station WOR. Because of the fact that local "color" is only necessary on such occasions, it is not necessary to "dress up" unless the actress is extremely temperamental and cannot go through her lines without being in costume.

Even at that, it is impossible to get a thrill out of being told that a certain party is a wonderful dancer. Maybe when we have Wireless Movies—don't laugh—they laughed at the Wright brothers—we may be able to get a peek at the "Premier Danseuse," but until that time we will have to be content with hearing the songs and lines. Even at that, what can be nicer than hearing a show broadcast while sitting home in your comfy chair with the old briar going strong and a nice cool pair of house slippers on—and the ice box near for a "midnight lunch"?

(C. Kadel and Herbert)



(C. Kadel and Herbert)

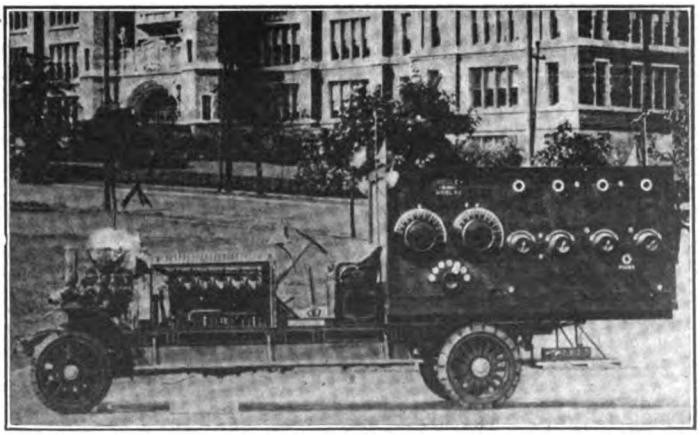
After the amateur successfully passes the test, he has to go in and listen to a talk on how a set should be operated and when and where to keep quiet. The photo shows J. W. Swanson, radio inspector, giving a group of five amateurs (yes, the two ladies want to be classed as amateurs, or O. W.'s on the air), a little talk on the secrecy of messages and the operation of the station during the quiet hours.

(C. Photonews)

W. H. Bullock, a New York radio engineer of note, has invented a novel indoor antenna. Using an ordinary window shade the wires are sewn around the edge. A loop effect is gotten very easily, and it can be tuned by raising or lowering the shade itself.

(C. Kadel and Herbert)

Leo and Helen Eisemann heard daddy talk about "birdies" in sets, so while dad and ma were out for the afternoon they started in to look for the "chippies," and even though they didn't find any, a good time was had by all—until daddy happened to see them and the remains on the lawn. And there was a fight being broadcast that night, which didn't make it any harder for dad to do his duty.



(C. Underwood and Underwood)

Huge receiver mounted on an Ahrens-Fox fire engine chassis, which formed one of the most interesting displays and floats in the Fall Festival parade recently held in Cincinnati. Music was received by means of the small receiver located on the back step under the big set, and the big horn was located in the large model. Music was received from Crosley Station WLW, and broadcast by means of a large horn inside.

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Radio Will Guide German-Built Zeppelin to America

By Carl H. Butman

(*Copyright*, 1923)

WASHINGTON, D. C.—Early in November it is expected that the Zeppelin Company will point the nose of the great German-built ZR-3 toward the west and the long over-seas journey of the navy's second airship will begin. On her maiden trip to her American home at Lakehurst, N. J., a distance of approximately 3,600 nautical miles, radio will guide this latest zeppelin.

She will not be under radio-control, as was the old battleship "Iowa" when sunk by naval gunfire, but radio will carry to her twice daily complete forecasts of the weather ahead and the meteorological conditions on the southern trans-Atlantic steamship route along which, it is understood, she will proceed under the direction of the German officers and crew. The only American officer who is certain of making the trip over is Capt. G. W. Steele, U. S. N., her future commander, but it is possible that Cmdr. Garland Fulton, Lt.-Cmdr. S. N. Kraus and Lieut. R. G. Pennoyer, naval observers now at Friedrichshafen, may also be among the passengers.

Briefly the characteristics of the new aerial passenger cruiser (she is not a war craft, at least not yet) are: length 660 feet, slightly less than the American-built ZR-1; diameter, 90 feet; power, four 400-HP Maybach engines, giving a speed of approximately 80 miles per hour. In one sentence, she is the last word in old-world airships and it will be interesting to witness a comparison and test with the new world's ZR-1, with which ship she will share the gigantic double hangar at the Lakehurst Naval Air Station.

Although the United States has no control over this craft during her flight over the Atlantic, nor, in fact, until she is officially delivered to the navy as a reparation ship, the government is to co-operate in "paving the way" on her first cruise. Through arrangements between the Weather Bureau, Navy, Shipping Board vessels and certain other North Atlantic ships, meteorological data from all along her route will be compiled and radioed twice a day to a station ship in mid-Atlantic. This vessel will have a powerful radio set and will transmit to NAA, Arlington, Va., bulletins for broadcasting to the ZR-3, both before and during her flight.

All details have been arranged between the Navy and the Weather Bureau. The plan includes the receipt of storm warnings, forecasts and statements of weather both at sea and ashore which might in any way affect the passage of the great airship. Observations will start a full week before the craft leaves Germany, and the reports will be on the air until she is housed in her hangar.

Little is known of the radio equipment of the ZR-3, but it is said that it is also of the latest German radio design, and that transmission and reception is assured all the way across the Atlantic, although half that range would be sufficient due to the co-operation of the station ship and station NAA.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

What do you radio, good cheer or the reverse?—Forbes Magazine.

* * *

The new radio station at Coltano, Italy, has been assigned the call ICC and operates on 10,750 meters. Station PCG is the call for the new station at The Hague, Holland, which uses a wave length of 12,500 meters.

* * *

Eastern radio fans have been invited to the World's Dairy Congress, by H. E. Van Norman, president of the congress, who spoke from the Westinghouse transmitting station, KDKA, Pittsburgh, Pa. The congress will hold sessions at Washington, D. C., on October 2 and 3; at Philadelphia, Pa., on October 4; and at Syracuse, N. Y.

* * *

Radio was enlisted last week in the search for William P. Massing, of Washington, D. C., whose father and mother were killed when a train struck their automobile at Crawfordsville, Ind., their home. Massing left Washington two weeks ago to travel through New England in an automobile on a vacation trip and had not heard of the accident.

* * *

The latest discovery reported from the research laboratories of the Western Electric Company is a solution of the mystery of singing oscillations noticed in radio receivers. One of the engineers by chance dissected a worn out "B" battery and found the cells wrapped in scrap sheet music. He claims that the notes so jazzed the electrons as to make them sing. He'd better destroy all evidence at once—the American Society of Music, etc., will be after him for back royalties.

E. F. W. Alexanderson, chief engineer of the Radio Corporation of America, is enjoying a trip in Europe and will return about October 15.

* * *

The General Electric Company has representatives at Caracas, Mexico, who are preparing a contract for the construction of a large radio transmitting station there, it is understood.

* * *

The naval radio station at Point Isabel, Texas, is being removed to Fort Brown, Brownsville, Texas, and combined with the army radio station there. Naval personnel will operate the station, using high and medium power tube sets.

* * *

Delicate electrical recording instruments are being shipped from the General Electric Company plant at Schenectady, N. Y., to be used in determining the nature and the strength of the electric current generated by the recently acquired electric eel at the Bronx Zoo, New York City. Preliminary rough tests show that the 5½-foot eel generates 15 volts. This was enough to knock down Keeper John Toomey twice when he was transferring the eel from one tank to another.

* * *

The medal of the Institute of Radio Engineers has been awarded to John Stone Stone for his pioneer work in radio. The presentation took place recently at the Engineers' Club, San Francisco, and was made by Col. J. F. Dillon, supervisor of the sixth radio district, in the presence of a distinguished assemblage. Mr. Stone is now living in San Diego, Cal., where he is engaged in research work as a member of the engineering staff of the American Telephone & Telegraph Company.

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Answers to Readers of Radio World

I am submitting a diagram of my six-tube receiver comprising three stages radio-frequency, detector, and two stages of audio, using parts as shown in diagram. Is it correct? Have you any changes to suggest? Do you think it advisable to incorporate a 23-plate condenser in the plate circuit of the detector tube? Will a condenser in the antenna or ground circuit be of any use? If so, what capacity? Will the circuit bring in DX stations?—Howard B. Dale, 103 Decatur Street, Brooklyn, N. Y.

The diagram is correct, except for some minor changes that can very easily be made. Remove the variometer from the grid lead of the first tube. If regeneration is wanted place it in the plate circuit of the detector tube, but with a circuit such as this, it is not advisable to use regeneration. Much better results will be had if it is not used. Also remove the 23-plate condenser from the plate circuit of the detector circuit and grid of the first tube. If neutrodyne reception is wanted with condensers, use separate neutrodons for each tube instead of the method you use. A 23-plate condenser in the antenna or ground lead will cut down on your wave length. It is advisable to use as few condensers (series) in the antenna circuit as necessary and do all the tuning with inductance. Should your set not tune low enough, however, use the condenser in the antenna circuit, and arrange a switch whereby it can be shorted when necessary. A 23-plate condenser will do. The circuit should bring in all the DX stations, weather, of course, permitting and careful tuning being used.

* * *

Does the DeForest set described in RADIO WORLD, *June 23rd, need shielding? If so, where is it grounded when a loop is used? Would an all-wave coupler or any other bank-wound coupler be more efficient than the regular type coupler in this circuit? Would you advise the UV201A tubes in place of the UV201 tubes? Does not the circuit as described need a grid leak?—D. J. Smith, Blackfoot, Idaho.*

If this circuit is carefully constructed and the parts placed with regard to inter-coupling effects, no shielding is necessary. Would not suggest the use of the bank-wound couplers, because of the fact that most radio-frequency transformers are made to work over a comparatively small band of wave lengths and by using an all-wave coupler you would not gain anything, but would not be able to use it at all. Use a coupler with a range of 200-600 meters. You may use the UV201A tubes very well in this circuit. No grid leak is necessary due to the fact that a crystal detector is used.

* * *

Can I use the UV199 tubes in the circuit described on page 9 of RADIO WORLD, *June 23? Can audio-frequency amplification be added to this circuit? In what position should the three coils be mounted on the panel? Should they be stationary or movable?—C. J. Minder, Muscatine, Ia.*

You may use the UV199 in this circuit. A suitable diagram for additional audio-frequency amplification appeared in RADIO WORLD, August 18, in the Answers to Readers department. Use the regular honeycomb coil mounting, which has one stationary coil in the center and two outer ones movable over a 90° arc. You can place the mounting in the most convenient position on the panel.

* * *

Kindly publish a circuit using three UV199 tubes. I have heard that these tubes need special circuits. Is this so? Are they good amplifiers? Can they be used in reflex circuits? Where may I find a good reflex circuit using two tubes and a crystal for rectification?—George Haneburger, Pittsburgh, Pa. Chas. E. Fisler, E.E., Engineering Department, Adirondack Power and Light Corp., Schnectady, N. Y.

You will find a circuit for three tubes in RADIO WORLD for September 1, 1923. The tubes do not need special circuits if directions are carried out and proper resistances are used. They are good amplifiers when used with a C battery, or some means of placing a negative charge on the grid. They can be used in reflex circuits.

For a reflex circuit using two tubes and a crystal refer to RADIO WORLD, March 3, page 4, where you will find the diagram you wish. (Fig. 1, using a loop). Honeycomb coils may be used in place of the loop by substituting antenna and ground for the loop and connecting the two honeycomb coils the same as a coupler, using one as a primary and the other as secondary.

* * *

I have a DeForest D7A receiver and would like to use 1½ volt tubes with the set. Is it possible? How should I do it and what changes will be necessary?—Geo. C. Boyer, Reno, Nevada.

You can use the 1½ volt tubes without changing the set at all. Get the WD12 tubes and plug them in the same as the regular tubes, substituting three dry cells hooked in parallel instead of the storage battery. Or use the WD11 tubes with adapters, using the same three dry cells. No other change will be necessary.

* * *

I intend to use a storage battery with the UV199 tubes. Where can I purchase a 60 ohm rheostat? Will a Bradleystat work? Can I use a 30 ohm rheostat and add one of the 25 ohm resistances to it in series?—Charles Cosman, 22 West Street, Fort Plain, N. Y.

We do not advise you to use a storage battery with these tubes. They are not meant for use with a storage battery and rheostats will only cause you trouble. Substitute the dry cells as specified. Were these tubes designed for use with storage batteries the manufacturers would so state. For a 60 ohm rheostat use the regulation 30 ohm rheostat with additional resistance in the circuit. A Bradleystat will work as the controlling factor as stated above. Yes.

* * *

Will you kindly publish in your Answer to Readers' column a two variometer, variocoupler circuit with amplification? Must be able to bring in the DX stations and have jacks for the amplifiers.—S. Horton, 1314 W. Grant Street, Plainfield, N. J.

Refer to page 12, RADIO WORLD, June 30. Mr. A. E. Herman has written a very excellent article regarding the construction and operation of this type of circuit, giving panel layouts and diagrams that will aid you.

* * *

Kindly advise me where I can obtain blue prints of a set using a loop. I cannot use the outside antenna and ground. Can you also furnish plans for the panel?—E. Lucas, 47 West Market Street, Akron, Ohio.

We do not carry blue prints or panel layouts. Should you need them apply to S. Newman & Co., 74 Dey Street, New York City, who handle matters of this sort and can supply you if you give your specifications.

* * *

How may I increase the wave length of a Coast coupler? Can I use honeycomb coils for the purpose? How should I do it?—R. L. Hilton, 2 Lawrence Street, Waterville, Me.

The wave length of this coupler may be increased by putting a honeycomb coil in series with the antenna and stator and another one in series with the grid and rotor. By so doing, any wave length may be conveniently reached by the use of the proper size coils.

* * *

I would like the most selective sensitive long distance receiver known. It must use two variometers and a variocoupler. Will the addition of a variable condenser and a tapped honeycomb coil make possible higher wave lengths and closer, finer tuning? Will it be of any advantage whatsoever? Will the circuit enable me to receive from coast to coast? How many amplifiers should I use to get best results? Should they be audio-frequency or radio-frequency? Will the Hartman spider web rotor variocoupler give better results than the optional coupler using a ball rotor and tapped bank wound stator? Is there any circuit known which is more selective and which will cover longer distances than this one? Where may I get the circuit diagram of the most selective and sensitive Cockaday four-circuit receiver? Can a coupler be substituted for the two 1,000-turn coils in the Leslie Libby circuit published in May 26 RADIO WORLD, front inside cover? Can any substitution be made for the three 25-turn coils used in the same circuit? What in your opinion is absolutely the best circuit yet discovered for my requirements?—George Allen Gerber, Burlington, Route 6, Wisconsin.

The Armstrong three circuit receiver (two variometer, coupler) is standardized and should be constructed as shown in any of a number of diagrams. A circuit was published in RADIO WORLD, June 30, explaining this circuit using two stages of audio-frequency amplification. It is not advisable to add radio-frequency to a circuit of this type as far as efficiency goes. Do not incorporate any additional condensers or inductances as they rob the circuit of efficiency rather than adding to it. Condensers are not used to tune the circuit and even the condenser in the ground circuit is unnecessary if the coupler is capable of fine tuning with taps. Receiving from coast to coast is a pretty large order, and while 2,000 miles has been covered with the receiver it is doubtful if it is a regular thing. Detector and two stages should prove sufficient for all ordinary purposes. Suggest you use the spider web coupler as it is more efficient as regards distributed capacity. The Armstrong circuit is extremely selective if properly handled, and is the favorite with thousands of fans who know how to operate it. Do not fool around with trick circuits if you wish success. As to a circuit that is better, there are any number that are as good, but we hesitate to prescribe any that are better, as that is almost impossible. Among the principal ones on a par with the circuit are the Hazletine neutrodyne, the Cockaday, the Reinartz, all of which are dependent upon the manner in which the set is constructed and tuned. You cannot use a coupler in place of the coils mentioned in the Leslie Libby article. Do not try to change any of the circuits to please your fancy, but stick to the original diagrams closely. The best circuits for the reception of extremely distant signals are the multi-tube superheterodyne circuits, but they are far too complicated and hard to tune to advise the amateur builder to construct them. Stick to the standard popular circuits and be assured of success. Furthermore, as to the distance any receiver will work satisfactorily over it is impossible to even give a guess. Too many exterior conditions govern the case, and receivers that will not work in one place perform wonders in other places.

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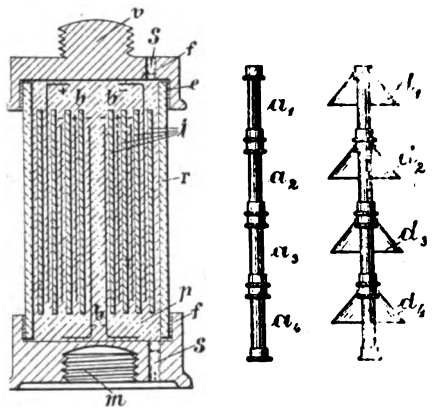
Latest Radio Patents

High Tension Condenser

No. 1,461,287: Patented July 10, 1923. Patentee: Emil Pfiffner, Frybourg, Switzerland.

The high tension condensers used hitherto for the purpose of protection from excess voltage for building up electric oscillation circuits and the like show various defects, which reside in their inadequate electric strength, both with regard to the puncturing of the dielectric between coatings of the condenser and with regard to the discharge at the leading in places.



Construction of condensers allowing flexibility and combining several new features of interest.

The high tension condenser described below avoids these drawbacks by subdividing the fall of potential at the terminals of the condenser into a number of partial falls and thus builds up the condenser from a number of partial condensers connected in series. By this means a far greater degree of safeness is obtained as regards the puncturing of the dielectric, as each partial condenser is capable of sustaining many times the partial fall of potential apportioned to it and even in the case of the puncturing of a partial condenser the remaining partial condensers still have sufficient electric strength to withstand the terminal voltage.

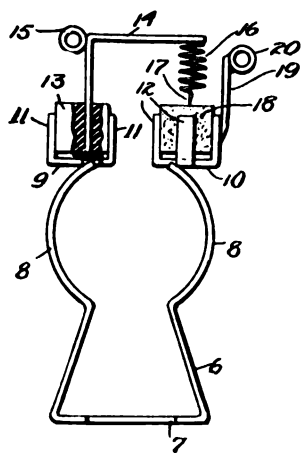
The condenser according to the invention is thus built on the principle of the socalled chain insulators, both as regards the dielectric between the coatings of the condenser and as regards the distribution of potential on the outer surface of the condenser, which is in communication with the atmosphere, while, in contradistinction to the ordinary chain insulators, the distribution of potential is an approximately fully uniform one, for the sake of greater capacity from member to member.

Besides the excellent electrical properties, this construction has the advantage, just as is the case with chain insulators, that condensers may be put together for voltages of any height, by connecting up a number of similar elements in series, each element of which is built for a relatively low voltage, an advantage which is of special importance from the point of view of manufacture.

Wireless Detector

No. 1,460,734: Patented July 3, 1923. Patentee: W. H. Ruf, Roselle Park, N. J.

My invention relates to wireless detectors, my more particular purpose being to give the detector such form that during its active use it may be readily carried around upon the person without causing inconvenience to the individual carrying it, and also to confer upon the detector a high degree of sensitiveness and to give the operator a special and immediate control over its sensitiveness, not generally attained in the use of a wireless detector.



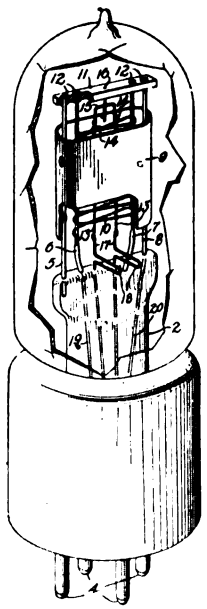
New detector for receiving sets.

Reference is made to the accompanying drawing forming a part of this specification, and in which like reference characters indicate like parts throughout the several figures.

Knoof's Electric Discharge Device

No. 1,456,565: Patented May 29, 1923. Patentees: W. A. Knoof, Brooklyn, N. Y. and P. P. Cioffi, New York, N. Y.

The invention relates to electric discharge devices and a method of manufacturing the same. It has for an object the provision of an electric discharge device in which the need for a glass support for the electrodes in the form of a cane or arbor is eliminated.



Constructional details of Knoof's tube, embodying several new features.

A further object is the provision of such a caneless or arborless electrode mounting as shall provide a rigid and compact electrode unit.

The invention in general comprises a plurality of electrodes which are mounted on a rigid wire frame which is connected to the usual press or squash and are by means of the arrangement of the frame rigidly spaced thereon from each other and the walls of the tube.

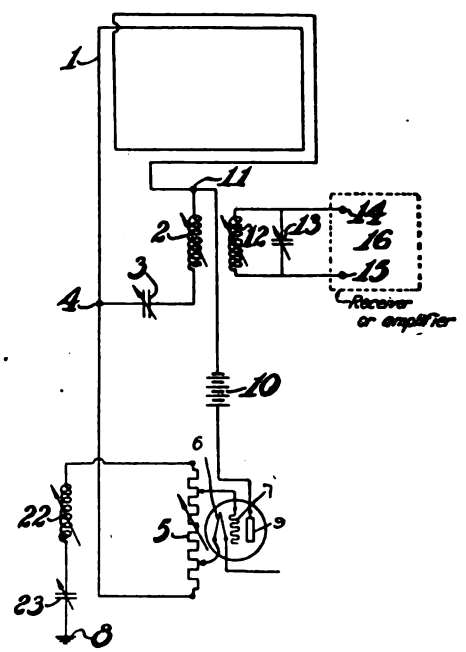
While in the preferred form of our invention, rigid wires are used as frame members, nevertheless a rigid frame providing the same degree of compactness and rigidity may be provided by the use of glass or other members in place of the wire members.

The invention is illustrated in the drawing which represents in a part elevation, part section view, a preferred form of tube embodying our invention.

Directional Radio Receiving System

No. 1,460,861: Patented July 3, 1923. Patentee: R. H. Marriott, Bremerton, Washington.

This application is filed under the provisions of the act of March 3, 1883, and applicant hereby consents that the invention disclosed herein may, if and when patented, be used by the Government or any of its officers or employees in the prosecution of work for the Government, or by any other person in the United States, without the payment to him of any royalty thereon.



System for the reception of unidirectional signals.

My invention relates to radio systems having for its object the unidirectional control of the receipt of signals. To get a unidirectional receiving arrangement, I combine the two-directional characteristics of a periodic loop antenna with the four-direction characteristics of the loop to ground, in the loop circuit via a thermiomic repeater, to neutralize one of the two-directional characteristics of the loop.

This arrangement eliminates the separate open antenna which have been used with periodic loops for unidirectional effects and is less critical for adjustment. Also this arrangement permits of the use of the periodic loop in place of the less efficient aperiodic loop and loop to ground which has been described for unidirectional effects by E. F. W. Alexanderson in Patent No. 1,375,992.

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New Applications of the Vacuum Tube

MOST of us are familiar with the ordinary applications of the three-electrode vacuum tube. The function of the tube as an oscillator and modulator, as a detector of high frequency currents and as an amplifier of both radio and audio frequency voltage is too well known by this time to warrant a repetition. Besides these two common uses there are a number of other applications to which the tube can be put, says a writer in the New York Tribune.

It is not a matter of common knowledge that the tube can be used as a voltmeter, measuring both alternating and direct voltages. For the measurement of alternating voltages three properties of the tube are made use of. These are the uni-lateral conductivity, the ability to amplify and the property of its being a voltage operated device. The last named property is very desirable, since it means that the tube requires but a small amount of power in the input circuit for its operation.

The circuit for measuring small a. c. voltages by electrostatic means includes an adjustable grid battery. The output circuit includes a plate battery and a direct current measuring instrument. In operation the plate and grid batteries are adjusted so the tube is being worked at the lower end of the characteristic curve, in which case the plate current will be reduced to exactly zero. If, now, an a. c. voltage is applied to the grid circuit, during a portion of the cycle, the grid potential will become more negative than the potential of the grid battery and during the other half of the cycle will become less negative. In the first case, the plate current will still remain zero, but in the second instance a current impulse will flow in the plate circuit and is measured by the plate meter. In order to return the plate current to zero the grid potential must be increased in the negative direction, and this increase is a measure of the peak value of the alternating voltage on the grid.

In measuring high tension voltages the potential is applied between the filament and plate of the tube. A specially designed tube with a high amplification factor is used. By means of a grid battery potentiometer the grid voltage is adjusted until the current in the plate circuit just falls to zero. Then by a simple mathematical equation the unknown voltage is calculated. To prevent arcing across the internal elements of the tube, the plate and grid are brought out at opposite ends of the tube.

As a power limiting device the vacuum tube finds a wide application. It can be used as a voltage and as a current regulator controlling the output of a generator. The tube in this case is connected in series with the field winding, the grid going to the moving arm of a variable resistance, across the field coils. When the terminal voltage of the machine tends to rise there is an increase of current through the resistance around the field coils. In accordance with Ohm's law, the potential across the resistance rises and in turn the grid becomes more negative and increases the resistance of the tube itself. The increase of the tube resistance cuts down the current through the tube, and hence through the field winding, since it is in series with the tube. When the terminal voltage tends to drop the same process goes on, but the grid in that case becomes positive in value. In controlling the current of a generator the tube is placed in parallel with the field winding.

Another very important use of the tube is in the ionization manometer, an instrument which measures exceedingly low gaseous pressures. It has been found that the gas pressure in a tube is proportional to the number of positive ions formed by the collision of the electrons with the few remaining gas molecules. This is only true, however, if the mean free path of the electrons in the gas is large as compared to the distance between the electrodes of the tube, which occurs at relatively low pressures.

In use the manometer is connected to the vessel containing the unknown pressure, which may be a high power vacuum tube. The grid of the manometer is kept at a positive potential, and the plate at a negative potential, both with respect to the negative end of the filament. The electrons emitted from the filament are attracted to the positively charged grid, some being caught and some slipping through the mesh of the grid and falling toward the plate. Since the plate is negative with respect to filament it is impossible for any of the electrons from the filament to ever reach the plate. They gather an increasing momentum while under the attraction of the grid and attain their greatest velocity in its immediate vicinity. Those that do manage to go through the grid mesh are subjected to two forces, which finally return them to the grid. One of these forces is the repulsion, due to the negative plate, and the other the attraction of the positive grid that the electrons had just passed through, now acting to pull the electrons back to the grid.

Suppose now that gas molecules exist in the surrounding space. Positive ions will be formed by collision if the speed of the electrons is sufficiently great. These positive ions formed between the filament and the grid go to the filament and those that are formed between the filament and plate are attracted by the negative plate and their flow can be measured by an ammeter in the plate circuit, which current flow is a measure of the number of positive ions formed. In the grid circuit is another meter which measures the electron flow to the grid, it being necessary to keep this flow constant.

Such a device indicates rapid changes in pressure because the reading of the plate meter is a direct indication of the amount of gas pressure in the surrounding space. Pressures as low as one billionth of a millimeter of mercury can be easily measured with the vacuum tube manometer.

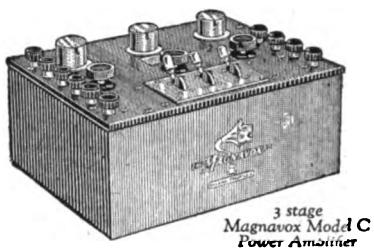
We have only just begun to realize the vast possibilities of the three-electrode tube, and the above-mentioned uses are but a few striking examples of what the researcher has learned to do with electrons.

WGY Is Heard in Iceland

WGY is the first American radio broadcasting station to be heard in Iceland. In May, Snorri P. B. Arnar, chief radio operator at Reykjavik, 2,600 miles from Schenectady, N. Y., picked up the General Electric Company station regularly, sometimes strong enough to operate a loud speaker. The Schenectady station has been heard at greater distances than Iceland but never before so far north, chiefly because of the limited number of stations in the thinly populated country. WGY has been heard in France, in Chile and in Hawaii. In his letter to the General Electric Company, Mr. Arnar writes:

"Allow me to call your attention to the fact that your wireless broadcasting station WGY, has been heard at this station, being the first American broadcasting station heard here. In May we heard it regularly when atmospheric conditions were favorable, sometimes strong enough to operate the loud speaker. Although other stations were heard, WGY was the strongest and only one I could get the call signal from. I thought this might be of interest to you, as this is the first report from Iceland of a station hearing an American station."

MAGNAVOX
Radio Products



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The Magnavox Power Amplifier Model C, as illustrated, is a true Power Amplifier, and free from elements of distortion.

Switching from stage to stage is made easy by master switches. Any standard amplifying tube can be used.

Without Magnavox equipment no Radio receiving set is complete.

Magnavox R3 Reproducer and 2 stage Power Amplifier . . . $90.00

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AC-2-C, 2-stage, $55.00
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$8,710,000,000 Crop Returns Make Farmers Rich Radio Prospects

THE campaign just inaugurated by the National Radio Chamber of Commerce to educate the farmers of the country in the practical every day value of radio, as announced in RADIO WORLD last week, comes at an opportune time.

The cash income of American farmers from sales of this year's crop will be about $200,000,000 greater than last year despite the slump in wheat prices, the Department of Research of the American Farm Bureau Federation has estimated, after a study of production reports and markets.

The increase, according to the report, is accounted for by a probable raise in the value of the cotton crop and of the dairy and poultry output.

Corn, the bureau estimated, will bring more than last year, but hogs may bring less, while it was estimated that cattle and tobacco will yield about the same as last year and wheat will bring considerably less.

The forecast for this crop year is $8,710,000,000.

Putting Radio on the Map of the World

IN its seventh of a series of circular letters addressed to government officials in charge of wireless telegraphy and radio telephony the world over, P. C. Kullman & Co., 110 Nassau Street, New York City, known as the wireless brokerage house, makes these statements:

"Can you, as an official, in charge of and controlling wireless telegraphy and radio telephony in your country, and having at your disposal abundant government funds for the advancement of industry and science, the education of your fellow-citizens, the entertainment and enjoyment of your people, remain inactive and silent in the face of this modern progress?

"Do you know that radio telephony affords employment to a million people in the United States of America?

"Do you appreciate that radio broadcasting is listened to by five million persons in the United States, night after night?"

The circular also carries extensive quotations from RADIO WORLD.

Who Are the Best Distributors?

MANUFACTURERS often ask us this question. F. A. D. Andrea, Inc., is one of the oldest and most successful manufacturers with its plant in New York City, so its judgment may be of value to others in the selection of distributors for Greater New York.

Following are the six well established concerns recently appointed by FADA as its exclusive distributors in the New York metropolitan district:

North American Radio & Supply Company, 5 Columbus Circle, New York City; North Ward Radio Company, 236 Halsey street, Newark, N. J.; Radio Stores Corporation, 218 West 34th street, New York City; Triangle Radio Supply Company, 122 East 23d street, New York City; Victory Electric Company, 1403 Bedford avenue, Brooklyn, N. Y.; National Light & Electric Company, 289 Market street, Newark, N. J.

A New Honeycomb Adapter

A NEWLY patented honeycomb coil adapter, perfected by the F. P. Hall Co., 30 Church Street, New York City, is one of the neatest adapters yet evolved. Due to the fact that a different type of adjustment is provided the range of coupling is practically unlimited as to fineness.

The device itself consists of an angular steel brace fitting against the panel, with the stationary coil at an angle of 45° below horizontal. The movable coil is arranged on a right angled piece well braced, with a screw adjustment which ends in a large knob on the front of the panel. The close coupling is absolute and the loose coupling separates the coils a distance of three inches which is sufficient for all purposes. To illustrate the fine control of the coupling it might be said that it takes 20 complete turns of the knob to separate the coils the full distance.

Aside from the fineness of adjustment the wide range of adaptability is another good point. It is so arranged that the builder may use two honeycomb coils as a variometer or anything his mind might suggest. It can even be used to provide tuned radio-frequency transformers, using two coils as the transformer, and accomplishing tuning by the use of the coupling. It is sturdily made, and needs only two holes to accommodate it to any panel.

Features of WLW's Program

STATION WLW, Crosley Manufacturing Company, Cincinnati, operating on 309 meters, will include in its program for September 17 a number of special Odd Fellows' features in connection with the Odd Fellows' Convention at Cincinnati.

On September 18 a special Atonement program arranged by the Avondale Synagogue will be featured.

TELEPHONE NUMBER CHANGED

The telephone number of RADIO WORLD has been changed to LACKAWANNA 6976

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

E. G. Voell, 435 Cattell St., Easton, Pa.
R. E. Bowman, 1215 West Eighth St., Wilmington, Del. (Interested in parts and a simple DX set.)
L. E. Eaton, Duncan, Okla.
Rafael Gabaldon, Bocono, Venezuela. (Wants correspondence with manufacturers with view to becoming distributor and retailer.)
Emeral White, Exton Ave., White Horse, Trenton, N. J.
F. Willard Halstead, 167 Park St., Waterloo, Iowa. (Manufacturer and retailer.)
N. W. Andrews, 518 Colo Ave., Walesburg, Colo.
Maurice & Co., Langton News, Delacourt Road, Blackheath, S. E. 3, England.
Nevada Electrical Engineering Co., F. W. Humrich, manager, Nevada, Iowa. (Retailer.)
William Bodley, 4915 Forsyth Ave., East Chicago, Indiana. (Interested in transmitting apparatus.)
George A. Muir, 292 Madison St., Memphis, Tenn. (Will open retail radio store shortly.)
Julius Joseph, Jr., 1114 Seaview Ave., Far Rockaway, N. Y.
Henry Du Bois, 171 Westminster Place, Lodi, N. J.
Geo. W. Blatchley, Jr., R. D. 6, Freehold, N. J. (Will build some new apparatus soon.)
R. G. Phillips, 63 East 36th Place, Chicago, Ill.
Vernon Jaynes, Box 25, Parkersburg, Iowa.
Albert Poivier, 1 Athletic Ave., Cote des Neiges, Montreal, Canada.
Leslie J. Voorhees, 27 Charles Street, Pittsfield, Mass.
Jerome Karmiol, 1526 39th street, Brooklyn, N. Y.
E. C. King, 836 N. Robberson Ave., Springfield, Missouri. (Will buy factory made set.)
Don Smith, Box 107, R. F. D. No. 2, Augusta, Kansas.
Arthur Beach, Beacon Falls, Conn.
John S. Welch, 316 East Twelfth St., New Albany, Ind.
W. N. Anderson, 2824 Euclid Ave., Kansas City, Mo. (Interested in home-made tube set.)
Mott Souders, Jr., 206 North Broadway, Red Lodge, Montana.

Station WOR Backs Down in the Music Fight

STATION WOR, operated by L. Bamberger & Co., Newark, N. J., has abandoned its appeal to the Supreme Court in the music copyright fight and has applied for and been granted a license to broadcast copyrighted music controlled by the American Society of Composers, Authors and Publishers, according to a circular issued by the latter.

The circular gloatingly concludes: "More than ample radio 'plugging' opportunities are now available to our members."

New Radio and Electrical Firms

The Audio Laboratories, New York City, has increased its capital stock from $5,000 to $20,000.

Kelly Electric Co., 523 Elm Street, Cincinnati, has been incorporated with a capital stock of $10,000.

S. Davis Electrical Co., New York City, $10,000; N. H. Streimer, B. B. Kalman, M. L. Margoshes. (Attorney, H. Margoshes, 302 Broadway.)

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Milwaukee Radio Amateurs' Club Resumes Meeting

THE first meeting of the Milwaukee Radio Amateurs' Club, Inc., following the annual summer recess will be held on September 20, at 8:00 p. m., in the Trustees' Room of the Milwaukee Public Museum. One week later the society, which is over six and a half years old and is now a non-stock corporation, will hold its annual corporate meeting at which there will be an election of members of the board of directors. The newly selected directors will then appoint the five general officers and the committee chairmen.

At the several mid-summer meetings of the present directors extensive plans were formulated for a fall membership campaign. Not only radio amateurs living in the city of Milwaukee will be invited to join the club, but all those residing in the city's suburbs and surrounding county. The society has long been affiliated with the American Radio League and in reality is a local section of it; therefore all of the A. R. R. L.'s local members will be solicited as well as licensed radio amateurs. The club is primarily one for amateurs, but membership is open to others interested in radio, particularly to technically inclined broadcast listeners.

A lecture program is being arranged. The committee in charge promises to present during the season some of the best known amateurs in the country as well as several high league officials and men in the commercial side of the radio field who have a known reputation as designers and manufacturers. Traffic discussions and means to reduce any local interference that there may be will receive the attention of some gatherings of the members.

General co-operation with all other interests in the radio field will constitute the policy of the Milwaukee club. No great financial obligations are assumed by joining, and with 100 per cent. of the amateurs represented the association can act as one for all amateurs in any question involving their rights. The club's mail address is 601 Enterprise Bldg., Milwaukee, Wis.

Radio Dealers in Mexico

THE Radio Trade Association, 1133 Broadway, New York City, has supplied to its manufacturer members a list of electrical dealers in Mexico with street addresses and other pertinent information. The importation of American radio apparatus into Mexico is duty free.

Radio Show Will Start Season With a Boom

THE second annual American Radio Exposition, which will be held at the Grand Central Palace, New York City, from October 6 to 13, is expected to inaugurate the biggest and best season yet enjoyed by the radio industry.

Over 60 exhibitors already have contracted for more than 100 booths and it is certain that when the doors are opened to the public every inch of exhibition space will be occupied.

A number of new features will be shown, all of special interest to people who are not now owners of receiving sets.

J. C. Johnson is general manager of the exposition. He may be addressed at the Grand Central Palace, New York City, for particulars regarding this important event.

Radio Protection for Nantucket Shoals

A NEW lightship, equipped with a radio fog signal, has been put into service on Nantucket Shoals, Secretary of Commerce Hoover announced recently.

The new vessel will have the first radio fog signal, an automatic apparatus sending during fog a group of four dashes every 30 seconds, enabling vessels with radio direction finders or compasses to obtain an accurate bearing from a distance of 30 miles or more in any weather, and to steer for and "make" the lightship. The light vessel will also have two other fog signals, a powerful steam whistle, and a submarine bell; a little later a submarine oscillator will be substituted for the bell. The electric signal light of 3,000 candle-power will show at the masthead. There is radio equipment for communication, with a radio operator in attendance, reporting vessels in distress, as well as for the maintenance of the light vessel itself.

Broadcasting in Sweden

THE status of broadcasting in Sweden is a curious one. The Government has now decided that transmitting stations will be constructed by the state, but will be leased to operating companies. Receiving stations may be established by private persons upon obtaining a license from the Government, Commercial Attache H. Sorensen at Copenhagen reports.

Radio Trade Notes

Maurice & Co., radio engineers, Langton Mews, Delacourt Road, Blackheath, S. E. 3, England, inform Radio World that they are desirous of importing American radio goods. Address Mr. E. N. Gill.

* * *

George A. Muir, 292 Madison street, Memphis, Tenn., will shortly open a retail radio store. He wants information on radio parts, cabinets and panels.

* * *

E. C. King, 836 North Robberson avenue, Springfield, Mo., writes to RADIO WORLD that he will be in the market in ninety days for a factory-made receiving set. He also is interested in sets having detector only and with one and two steps of audio-amplification.

* * *

L. H. Hardy & Sons, Inc., have opened a retail radio store at 528 Sixth Avenue, New York City.

Sunday Program from Station WGI

ON Sunday, September 16, Station WGI, Medford Hillside, Mass., will broadcast the following program:

4:00 P. M.—Twilight Program.

1. "Adventure Hour," conducted by the Youth's Companion.
2. Stories by Arturo.
3. Concert Program by the Edison Laboratory Phonograph, courtesy of Vocalion Hall.

8:30 P. M.—Evening Program.

1. Twelfth of a series of talks on "World Unity," conducted by the Federation of Churches.
2. Musical concert arranged by Miss Alice McLaughlin, soprano.
3. Musical concert arranged by Frederick K. Hall, violinist and pianist.

Coming Events

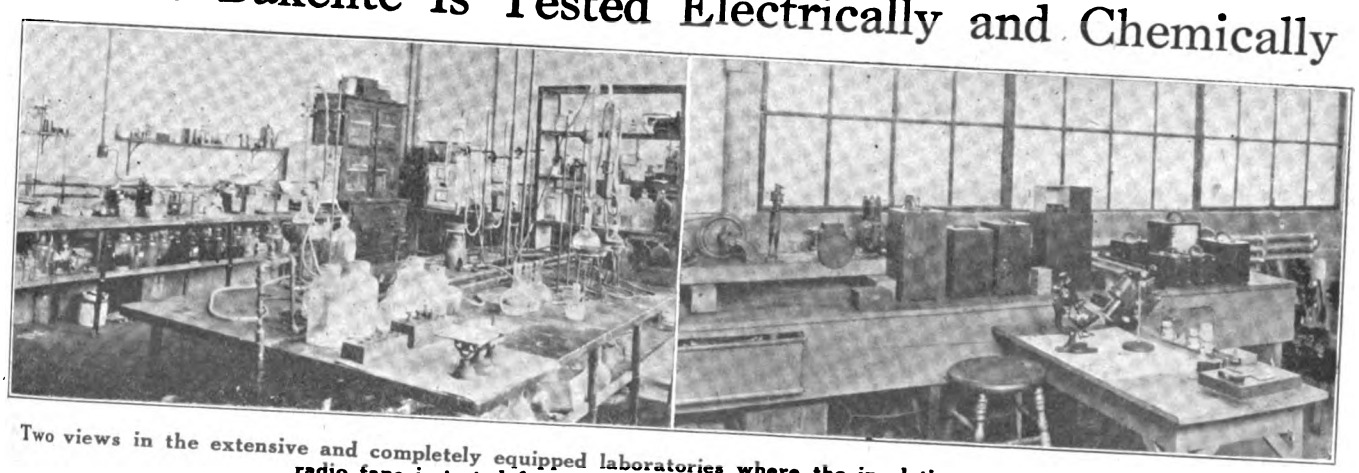
NATIONAL RADIO WEEK, November 25 to December 1, 1923.

AMERICAN RADIO EXPOSITION, Grand Central Palace, New York City, October 6 to 13, 1923. J. C. Johnson, general manager.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pacific Coast convention, Del Monte, Cal., Oct. 2-5. F. L. Hutchinson, 33 West 39th Street, New York.

AMERICAN RADIO RELAY LEAGUE, second national convention, Chicago, Ill., September 12-15, 1923. Chicago Radio Traffic Association, 959 The Rookery, Chicago, Ill.

Where Bakelite Is Tested Electrically and Chemically



Two views in the extensive and completely equipped laboratories where the insulating material "bakelite," familiar to all radio fans is tested for mechanical strength and insulating qualities.

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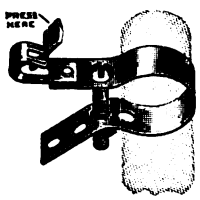
IMPROVED GROUND CLAMP



Equipped with FAHNESTOCK PATENT Wire Connectors Easily Attached

No Soldering—For Radio Use Only

AT YOUR DEALERS

FAHNESTOCK ELEC. CO.

LONG ISLAND CITY, N. Y.

Reinartz Coil $1.85

The Improved Basket Weave, Covering All Broadcasting Wavelengths

With each coil we send FREE two large blueprints, picture hookup and panel layout, list of materials, and fully illustrated instructions for construction and operation.

Buy before the fall rush sets in.

We sell all parts required for this wonderfully efficient receiver—panel, coil, condensers, socket, vernier rheostat, variable grid leak, dials, switches, posts, contact points, wire, spaghetti, etc. (no tubes or phones) for only $9.85. Postage additional on all shipments.

Send no money. PAY THE POSTMAN. All goods shipped Parcel Post C. O. D.

RADIO SURPLUS STORES

HELENA, MONTANA

Cyclone

WORLD'S BEST

"A" and "B" BATTERIES specially built for your Radio Set in all types.

Highest quality GUARANTEED for DISTANCE, CLEARNESS, and LONG LIFE.

Standard Electric Novelty Co.

NEW YORK CITY

Best proposition for Jobbers and Dealers. Some territory still available for New Distributors. Write for details at once.

Radio Tubes Repaired

$1.50 $1.50 $1.50

Send old tubes with $1.50 and receive by **return mail** a guaranteed tube. Be sure and state **in your letter** type wanted; **detectors** or **amplifiers.**

New Tubes Cut Prices

Price List of New and Repaired Tubes Free!

Guaranteed A tubes . . . $2.00

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W. H. BRYANT

453 Washington St. Boston, Mass.

RADIO WORLD

TELEPHONE, LACKAWANNA 6976

PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK) FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y. BY HENNESSY RADIO PUBLICATIONS CORPORATION

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Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.

Add $1.00 a year extra for foreign postage. Canada 50 cents.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

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Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

WGY Is Easy to Get

AN interesting record of radio reception was recently reported by M. .S. Shapleigh, a Waynesboro, Pa., radio fan who has been in the air nightly since February 20, 1923. His log shows that up to July 31 he listened in 151 nights and during that time picked up WGY, for the whole or part of the program, 82 nights. Inasmuch as WGY was not in the air forty nights during the period observed, the Waynesboro man missed the General Electric Company station only 29 nights. In his report, Mr. Shapleigh writes: "WGY tunes in easier and with less interferences than any of the 65 stations we have listened to since we got our set." Waynesboro is approximately 260 miles from Schenectady, N. Y., the home of WGY.

He Used Radio Bait

A FISHERMAN who was having wonderful success while his friends were coming home with only empty creels and appetites was asked by one of them to what he attributed his exceptional luck.

"Luck?" he snorted, "that isn't luck! I just cater to the fish."

"Cater to the fish? What do you mean?" queried the mystified friend.

"Well, I take my radio set along and drop the ground wire down along side of my hook. Then I tune in station WORM," he said—and started to run.

Strong Praise—Thanks!

EDITOR, RADIO WORLD:

I buy RADIO WORLD regularly because it has more real meat for the "radio bug" than any other publication—and I read them *all.*

Yours truly

PAUL THORNE.

927 Buena Park Terrace,
Chicago.

POSTER'S Perfect-PANELS

FORMICA or BAKELITE

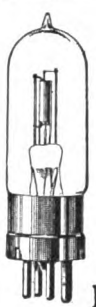
ENGRAVING DRILLING

POSTER & CO. INC.

61-63 DUANE ST.

WORTH 3569

Dealers Kindly Write for Samples and Wholesale Prices



WE REPAIR

RADIO TUBES

WD-11	$3.50	UV-199	$3.50
WD-12	3.50	C-299	3.50
UV-200	2.50	UV-201A	3.75
UV-201	3.00	C-301A	3.75
C-300	2.50	UV-202	4.00
C-301	3.00	C-302	4.00

Mail orders solicited and promptly attended to.

Dealers and agents write for special discounts.

H. & H. RADIO CO.

P. O. Box 22-B

Clinton-Hill Station Newark, N. J.

VACUUM TUBES REPAIRED

WD11—WD12—UV201A—UV199—and others for

— $3.00 —

Quick service—All tubes repaired by us guaranteed to work as good as new. Send your dead tubes—we prepay parcel post to you. All you pay is $3.00 to postman. We give 48-hour service.

Thomas Brown Co.

511-517 Orange St. Newark, N. J.

Write Plainly

ON APPROVAL FOR 30 ¢

ZOBEL-STEIN LABORATORIES

322 9TH ST. BROOKLYN, N.Y. SOUTH 2650

10c

Brings you our new catalogue and radio information booklet illustrating and describing the Super-Regenerative and other latest and popular circuits. Our technical staff is at the disposal of our customers. Make use of their knowledge. Merchandise shipped immediately on receipt of order.

U. S. Bureau of Standards "Radio Book." Special ..... 10c.

FREMONT RADIO SALES CO.

227 FULTON STREET, NEW YORK CITY

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More Prizes for Radio Drama

THE announcement by WGY, the General Electric Company radio broadcasting station, of a prize offer of $500 for the best radio drama submitted during the three months period ending November 30, has brought hundreds of letters of inquiry and there is every evidence that many contributions will be made.

Additional prizes in varying sums up to $100 will be awarded for other plays deemed suitable for radio production. The offer of the General Electric Company is made for the purpose of stimulating interest in the writing and development of a new form of drama, a play which reaches its fullest appreciation through the ear, the mind and the imagination.

Plays will be considered that fall under any of the following classes: Drama, melodrama, comedy-drama, comedy and farce-comedy. Manuscripts must be original and must be accompanied by written permission of author (or, if copyrighted, by the person or persons controlling the copyright) giving the General Electric Company exclusive right to produce the play by radio. Rights for use other than radio may be reserved by the author. Two copies of each play must be forwarded and should be sent by registered mail. The author should retain a complete copy.

The author's name must not appear on any manuscript offered in competition. Instead, the manuscript should be signed with a *nom de plume*, which must also be written on a sealed envelope containing the contestant's real name, address and permission granting exclusive right to produce the play by radio. This envelope should be enclosed with the manuscript and will not be opened until the award has been made. A synopsis of the play must be attached to each manuscript.

A play requiring one and a half hours for performance is desirable; in any case the time should not exceed two hours. Small cast plays, employing five or six characters are best adapted to radio, as they permit quick comprehension of the plot and give rise to no confusion in distinguishing characters. Plots must be clean with no attempt at questionable situations.

Jewish Religious Services to Be Broadcast

RADIO as a vehicle for overcoming religious misunderstanding is to be utilized by the United Synagogue of America, according to an announcement issued last week by Rabbi Samuel M. Cohen, executive director of that organization, which comprises the 175 leading conservative Jewish congregations of the United States. Arrangements for broadcasting complete programs of religious services preceding all the Jewish festivals have been made by Rabbi Cohen with the American Telephone & Telegraph Company. The programs will be sent out from WEAF and WMAF.

San Francisco-Cavite by Radio Twice Daily

THE United States Navy Radio station at San Francisco now receives messages direct from the station at Cavite in Manila Bay twice daily as a result of improvements just completed.

The two schedules of filing are at 2 A. M. and 2 P. M. Previous to the recent improvements the only filing schedule was at 2 A. M.

The distance by great circles from Cavite to San Francisco is 6,221 miles, and so far as known is the longest one way radio circuit in the world actually handling traffic.

SUNBEAM

COCKADAY COILS $2.50 A SET

17-Plate Vernier Condenser.....$2.25

PANELS—GRADE A RUBBER

7 x 10.....65c 7 x 12.....80c 7 x 14.....90c
7 x 18.....$1.25 7 x 24.....$1.65

Parts for Neutrodyne set *Complete line at special prices*

23-Plate Vernier Condenser.....Special, $2.25

Send us your address—Get our Special Weekly Offerings.

SUNBEAM ELECTRIC COMPANY

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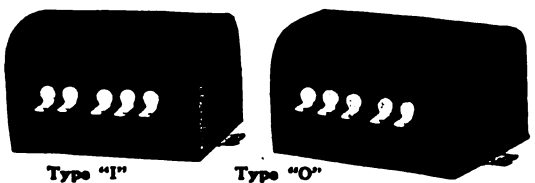
COMO DUPLEX TRANSFORMERS

The COMO DUPLEX SYSTEM of audio-frequency amplification gives the maximum volume without distortion and tube noise.



Type "I" Type "O"

COMO APPARATUS COMPANY

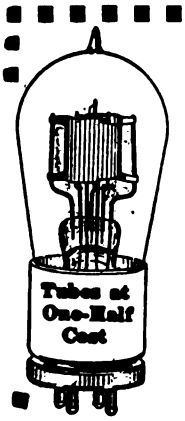
446 TREMONT STREET BOSTON, MASS.

There is a combined filtering action which assures perfect results when ordinary amplification fails.

It can be added to your present amplifier, giving you power amplification on the weak signals that more of the ordinary amplification would kill.

Sold only in matched Pairs, $12.50

A copy of C. White's "HOW TO MAKE A POWER AMPLIFIER" is yours for the asking.



IT HAS HAPPENED TO ALL OF YOU IN A FRACTION OF A SECOND!

WHEN the filament burns out, at least $5.00 goes with it to put the set in operation again.

WHY not save nearly one-half the cost of a new tube by sending us your burned out or broken tube to be repaired?

WE REPAIR EVERY TYPE OF tungsten wire filament receiving tube. All our tubes are TESTED and GUARANTEED to function as well as when new.

All tubes returned P. P., C. O. D.

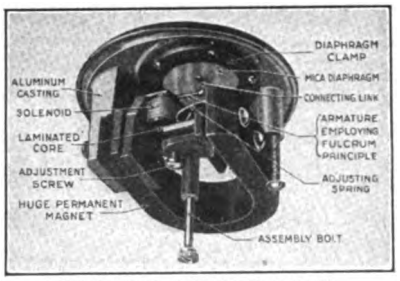
HARVARD RADIO LABORATORIES

BOSTON P. O. BOX 1781 MASS.

THE TRINITY LOUD SPEAKER

TYPE "A1"
21" FIBER
HORN
$25.00

TYPE "B"
(For Phonographs)
$12.50



INTERIOR CONSTRUCTION

An ear phone is an ear phone no matter how fancy the horn that covers it may be, and, due to the delicate construction of an ear phone it is utterly incapable of giving true tone reproduction, especially, when relatively large currents are passed thru its coils, such as the output of a two-stage or power amplifier.

The Trinity Loud Speaker element embodies the well-proven and tested principles of the phonograph reproducer with the soundest principles of electromagnetic design best adapted for loud speaker operation. It is not an ear phone when placed on a head band and a loud speaker when covered with a horn. It is a sturdy loud-speaking element ALWAYS.

Send for Literature.

TRINITY RADIO CORPORATION

446 TREMONT STREET, BOSTON, MASS.

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EXTRAORDINARY SUMMER SUBSCRIPTION OFFER

Radio World and Other Popular Radio Publications for the Price of Subscription for Radio World Alone

Radio World has made arrangements
—by which it is possible
—to offer a year's subscription for
—any one of the following publications
—with one year's subscription for
—Radio World:
—RADIO NEWS or
—POPULAR RADIO or
—WIRELESS AGE or
—RADIO DEALER or
—RADIO (San Francisco)

This is the way to get two publications
—for the price of one:
—Send $6.00 today for Radio World
—for one year (regular price
—for 52 numbers)
—and select any one of the other
—four publications for twelve months—
—Add $1.00 a year extra for
—Canadian or Foreign postage.
—This offer good only up to and
—including September 25, 1923.
—Present Radio World subscribers
—can take advantage of this offer by
—extending subscriptions one year NOW.
—Or order thru your newsdealer.

RADIO WORLD'S SPECIAL TWO-FOR-PRICE-OF-ONE SUBSCRIPTION BLANK

RADIO WORLD, 1493 Broadway, New York City.

Enclosed find $6.00, for which send me RADIO WORLD for twelve months (52 numbers), beginning ....., and also, without additional cost, Radio News, or Popular Radio, or Wireless Age, or Radio Dealer, or Radio for twelve months beginning .....

Name .....

Street Address .....

City and State .....

This Offer Good Only Until September 25, 1923

The Wireless Oracle

By Hirsch M. Kaplan

Say, did you hear the Zimbler Trio? You didn't, and they were on the air twice? Well, you must be asleep!

WFI gave us an afternoon program by the Bellevue-Stratford Orchestra. They're the berries.

I think in the near future we'll conduct a contest for the most popular orchestra that plays or has played over the radio. What do you say?

For you fans who would like to continue dancing after the Lucky Strike Orchestra has done their bit, I suggest tuning in Meyer Hoffbrau's Orchestra at Station WGY.

Lillyan May Challenger is still making herself a favorite with the radio audience.

WHAZ makes me think that they are a local station by the way that they come through. They had some good vocal selections to offer.

WDT, you made an attempt at improving your station, but aren't you going through with your plans?

Again we see that this column must do some good, for again we've had the celebrated violinist Illumento Miserando over the air. Fine stuff, Illumento.

WNAC helped us to pass a pleasant half hour by offering the Cherub Trio.

"Jolly Bill Steinke," the popular artist, was with us once more. He had his dog with him or I'll say that he gave a fine imitation of one. Excuse me for giving your secrets away, Bill.

Just let me give you readers who have no radio sets at present a bit of advice. The programs are getting better and better each day. There is no doubt that when the cold weather arrives and we don't wish to leave the house, the programs then offered will make us forget that the cold weather has arrived. So, you'd better get your set now and not miss anything.

Station KLK, the Oakland "Tribune's" station at Oakland, Cal., is now sporting a slogan. If you should hear "Where Rail and Water Meet" some evening or morning, you'll know where it comes from. Little danger now, though.

Where do all these swell orchestras come from? This time it's the Blue Ribbon Syncopators. They're some jazz babies.

Yes, Roxy and his clique were on the air again and they were better than ever.

Well, I suppose you danced to the music of the Hotel Astor String Ensemble and Orchestra, What! You didn't? What's the matter—got two left feet?

The Four Aces Male Quartet from WMAF had a splendid program.

Would appreciate hearing from you folks as to how you like this column. Any suggestions or criticisms would be

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LATEST BROADCASTING MAP IN COLORS FREE to RADIO WORLD SUBSCRIBERS

The latest radio broadcasting map of the United States and Canada, containing all the new allocations and changes, is offered *free* to subscribers for Radio World who send in their subscriptions within the coming four weeks. This map is printed on fine map paper stock and has just the information you want regarding broadcasting stations throughout the continent, including army and navy stations.

If you are already a subscriber you can get this map by renewing your present subscription now.

Send direct to this office or you may subscribe thru your newsdealer who can send your subscription direct to us.

Use the coupon attached.

Offer open until Oct. 1, 1923.

RADIO WORLD FREE MAP SUBSCRIPTION BLANK

Radio World,
1493 Broadway, New York.

For the accompanying $3.00 please send me Radio World for six months (26 numbers) beginning with issue dated .....and also, without any expense to me whatsoever, the latest radio map as advertised.

Address .....

City and State.....

If you wish two maps, one for yourself and one for a friend, send $6.00 for a yearly subscription and the two maps will be sent to different addresses if you wish.

Name .....

Heard at the Radio Counter

Part XXII

SAY, Brown, have you noticed that there was not such a slack summer this year as last?"

"Have I? Now you're talking foolish. Didn't I lose a week of my vacation just because of it?"

"Well, you should worry, look at the extra commissions that you will get—maybe."

"Well, that's O. K., but you know that I think that the reason for the whole thing is that last year the amateurs were sceptical about summer receiving, simply because they had heard of the bug-bear of static, and this summer they realized that it was not such a terrible thing because of the explaining done in various magazine articles."

"Guess you're right there, old man. Wonder what this fellow wants? He has been looking in the window for the past half hour and finally seems to have picked up enough courage to come in. Guess I will take him, and then go out to lunch. Wait for me, will you?"

"I beg your pardon, but I wonder if I might ask you for some information regarding an inexpensive receiving do-dad for my nephew?"

"Surely, about how much did you want to expend in the purchase of a set? We have them at all prices."

"Well, I understand that those that have lamps are pretty expensive, but I am willing to spend $50.00 if that will get a complete machine."

"Well, we can sell you this one over here for $48.50 complete this week, from antenna to ground. It is a special sale, and a very fine instrument made by a Western concern. Would you care to see it demonstrated? Kindly step over into this booth, and I will connect it for you."

"Why, that is fine, it seems so loud and clear. What station is that talking now?"

"That is WOR, Newark, New Jersey, giving baseball scores."

"Really, do they give out the scores by, er, radio?"

"Surely, and that is not all. The latest sport news as well. I take it you are interested in baseball?"

"Well, I never did care for nothin' in the way of sports except the game. Wonder if I could take that now? Do you have them done up, or do you have to send them?"

"We have them all packed in export cartons. Be careful to follow the diagram in connecting the batteries and unpacking the tube—do not call it a lamp."

"Well, here is your money. I want to thank you, and I will drop in if I have any trouble."

"Perfect. Good day, sir."

WOC Resumes Full Schedule

STATION WOC at Davenport, Iowa, announces that it will resume its full winter schedule on Sunday, September 16. This schedule comprises a musical program every night in the week, except Tuesday, and a more extensive program on Sunday evening than heretofore. Details of the new programs will be released through the various publications and will be announced by radio, so that all may acquaint themselves with the changes being made.

Back numbers of Radio World supplied at regular price of 15c. a copy. Any 7 copies for $1.00. Radio World, 1493 Broadway, New York.

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Guaranteed!
$3.98
Money back if they do not satisfy after
5 DAYS TRIAL
SEND no money! Order by postcard and pay postman on arrival. If they do not excel any other phones you ever used regardless of price, return them and your money will be refunded at once.
GUARANTEED ONE YEAR
AMBASSADOR
LONG RANGE PHONES
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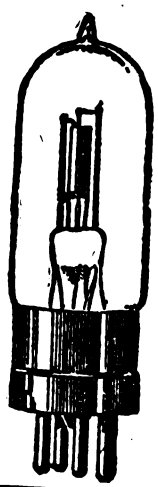
PADEREWSKI KNOWS QUALITY
HE SELECTED
THE ACOUSTICAL AMPLIFIER
BEL-CANTO
TRADE MARK

4 REASONS WHY
1. Large Heavy Base Eliminates top heaviness.
2. Combination Rattan Reed and fiber strengthens horn and gives beautiful quality without distortion.
3. No adjustment necessary; will work perfectly on any good two-stage set.
4. Guaranteed against mechanical defects of any kind for one year.

Dealers and Jobbers Write for Territory Discounts.

BEL-CANTO MANUFACTURING CO.
417 East 34th Street, New York City
Phone: Vanderbilt 8959

Radio Tubes Repaired



Send in Your Broken Down, Burnt Out Tubes

$1.50 AND UP

We Repair and Guarantee Them to Function Equal to New.

Mail Orders Promptly Attended to

$1.5 with order

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ROOM 510
Dexter Building,
453 Washington St.
BOSTON

New York Prices
DIRECT TO YOU
A Money-Back Guarantee
WE SELL ONLY STANDARD PARTS AT LOWEST PRICES

Kohler's DX Coupler	$1.75
Kohler's DX Variometer	1.75
Kohler's DX 11-Plate Condenser	1.25
Kohler's DX 17-Plate Condenser	1.39
Kohler's DX 23-Plate Condenser	1.50
Kohler's DX 43-Plate Condenser	1.65
U. S. L. 23-Plate Vernier Condenser	3.10
U. S. L. 43-Plate Vernier Condenser	3.45
Acme Audio Transformer	4.00
Acme Radio Transformer	4.00
Amertran Audio Transformer	4.00
Kardon Audio Transformer	6.25
All American Transformer	3.75
Baldwin Type C, Single Phones	4.25
Stromberg-Carlson Phones	4.50
Brandes Phones (New Type)	6.00
N. & K. Phones, 6000 ohms	6.00
Ambassador Phones	6.50
	3.98

Many Other Bargains. Complete Stock. Write for Prices.

Send Money Order or Certified Check and include Postage.

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115 West 23rd Street New York

Tune in the world with a CROSLEY Model XJ

Sebring, Fla., heard Honolulu. A man writing from Nassau, British West Indies, says, "First of all on Friday night last June 29, 1923, I heard Honolulu." These records were made with a Crosley Model X. Thousands of letters have come to us unsolicited, telling of the wonderful performance of this instrument.

The new Model X-J, combining all the features of the Model X, with greater refinement of detail, is even better. It is a 4-tube set incorporating one stage of tuned radio frequency amplification, detector and two stages of audio frequency amplification with jack to plug in on three tubes for head phones, new Crosley multistat, universal rheostats for all makes of tubes, new condenser with molded plates, filament switch and other added features.

We believe the Crosley Model X-J to be the most efficient radio receiver ever offered to the public regardless of price. Write to-day for free catalog describing the Model X-J and other Crosley receivers and parts.

For Sale by Good Dealers Everywhere.

Crosley Mfg. Co.
9403 Alfred Street
Cincinnati, Ohio

SEND THIS COUPON

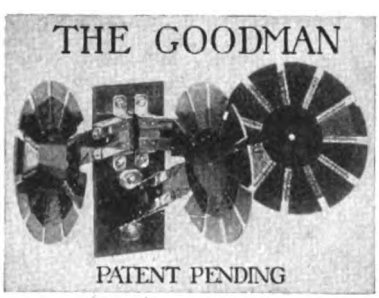
Crosley Manufacturing Co.,
9403 Alfred St., Cincinnati, Ohio.

Gentlemen: Please send free of charge your complete catalog, together with your booklet entitled "The Simplicity of Radio."

Name .....

Address .....

.....



The Niftiest Short Wave Tuner on the Market Only $6.00 & PP on 1 lb. Send for pamphlet.

L. W. GOODMAN
DREXEL HILL, PA.

Mr. C. H. Jenkins, Audubon, N. J., writes:—"On July 13th, tuned in WBAP, Fort Worth, Texas, (476 meters), with the GOODMAN, while WDAR (396 m.) and WOO (509 m.), powerful local stations, were broadcasting dance music."

Don't Ask for Rheostat—Say

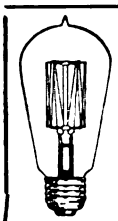
FIL-KO-STAT

FOR REAL FILAMENT CONTROL

Federal Standard Radio Products

Standard of the Radio World, 130 separate units, each fully Guaranteed.
Write for Catalog.

Federal Telephone and Telegraph Co.
BUFFALO, N. Y.



We Sell New Tipless Electric Bulbs for Home and Stores

Also Miniature Bulbs for Automobile and Decorative Purposes at CUT prices. BEST GRADE ONLY. Agents Wanted.

Vacuum Electric Wks.
Station C Toledo, Ohio

Propose a Broadcasting Monopoly for Sweden

A NOVEL plan for organizing radiophone broadcasting in Sweden, designed partly after studying experiences in other countries, especially the United States, and following the lines previously drawn up by the Swedish Government Department of Telegraphs, has been submitted to the Government by a corporation now being formed. This company seeks a joint monopoly with the Government on radiophone broadcasting in Sweden. Among the founders of the new corporation are the L. M. Ericsson Telephone Company and leading manufacturers of electrical and radio apparatus.

The plan provides for extensive co-operation with the Government, which is to erect the sending stations successively. These stations will be at the disposal of the new operating company at least five hours a day for an annual fee corresponding to 6 per cent. of the cost of construction of each station. In addition the company must pay for the power as well as for the bulbs used.

It is suggested that individual owners of receiving sets be required to pay an annual license fee of 20 kroner, or about $5.40, and that societies, places of entertainment, etc., pay a maximum fee of $1,000 kroner. Any make of receiving set may be used. The operating company agrees to provide in its constitution that the annual dividend shall not exceed 7½ per cent. cumulative. The period of the company's concession is for ten years ending in 1934, after which the Government is to have first option on taking over the complete monopoly upon the payment for the equipment.

One of the clauses in the proposal provides that whenever the state has some urgent report to broadcast during the company's allotted period of five hours, such report shall be sent broadcast without a charge to the state. The radio entertainment program includes general news, economic reports, weather reports, lectures, etc. On Sundays religious programs will be given. It is planned also to have special programs for children during the week.

Regarding the broadcasting of advertising matter the new company endorses the government's recommendation that this be limited. It proposes that such material be of the type usually run in newspapers as reading notices. The danger of unfair competition with newspapers in the distribution of news will be avoided through an arrangement with the Central Co-operative News Agency of the Swedish Press, which will select and edit all the news.

$7,000,000 for Ford Advertising Next Year

YOU'D think that if there was one thing in the world that didn't need advertising, it would be the Ford car. Henry Ford doesn't think so, however. In spite of all the free publicity the car gets, in spite of the fact that at present the production is behind the demand, Mr. Ford has announced that his company will spend $7,000,000 in newspaper and magazine advertising in 1924. Any business man in the radio field can afford to follow Henry Ford's ideas—he's proved their worth.

DON'T LOSE A SINGLE NUMBER
Send $6.00 for Radio World and get 52 issues without a break.

TELEPHONE NUMBER CHANGED

The telephone number of RADIO WORLD has been changed to LACKAWANNA 6976

PROTECT
THE HEART OF YOUR RADIO SET

Vacuum Tubes are costly and extremely delicate. B battery or any other excessive current applied for only the fraction of a second to the filament leads will burn out your tubes.

You have probably already had this experience and it is apt to happen again at any time.

A burnt out tube means money lost—the set out of commission — inconvenience to you.

Why Take These Chances When RADECO SAFETY FUSES

will absolutely protect your tubes. Applied in an instant to the filament terminals. Will fit any standard tube or go in any standard socket. Fully guaranteed. **50 cts. each. Sent Postpaid.** Delay may be costly. Write now. Specify type of tube used.

DEPT. 5

Radio Equipment Company
536 Washington Street Boston, Mass.
New England's Oldest Exclusive Radio House
Distributors of many other successful Radio Specialties. Dealers:—Write for our proposition and full details.

Build Your Own HAZELTINE NEUTRODYNE with FREED-EISEMANN Licensed Essential Parts

Complete wiring diagram, instructions, etc. sent in special container with patented essential parts. Three NEUTROFORMER COILS mounted on variable condensers, and DOUBLE NEUTRODON (as illustrated), sent for **$24.00.** Ask your dealer to show you these parts, as well as complete assembled five-tube Neutrodyne Set in mahogany cabinet, Model NR-5, **$150.**

Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

FREED-EISEMANN RADIO CORPORATION
253 Fourth Avenue New York
Licensed by I. R. M. Inc. Under Hazeltine Patents

To Radio World readers who may have missed recent numbers

The newsstand sales of Radio World have increased so rapidly for several weeks past that some of our readers were disappointed to find their regular newsdealers had sold out their supplies. This is for you; if you are among the disappointed ones: Send 15c. per copy and we will mail you any of the recent issues that you may have missed, so that you can complete your files.

RADIO WORLD
1493 Broadway New York

YOU CW BOYS!

Do You Want to Change Your Transmitter or Are You Planning to Build One?

Then you will want these back numbers of Radio World: March 31, A Low Power CW Transmitter, by C. White. April 21, Haus Transmitter, by John Kent (circuit used by 2VK). May 5, Combined CW and Phone Set of M. Bebaut, at Radio Central. May 26, A Simple CW or Phone Set That Works. R. W. H. Decker, 2UA. These numbers describe in detail all the various parts, with complete instructions as to how to operate. No up to date amateur should be without them. 15c. a copy. The four copies for 60c. or start your subscription with any number.

State Your Radio Wants in Radio World's Classified Dept. Five Cents a Word, Ten Words Minimum.

PATENTS
promptly procured. Trade Marks secured & registered
FREE! INVENTION RECORDING BLANK

FREE MANUFACTURERS PATENT CO. INC. 520 FIFTH AVE NEW YORK

Italy May Get Radio Station from Germany

Writing from Rome, Italy, Commander A. Tosi informs the New York Tribune that a question which is interesting to radio as well as governmental circles just now is: "Should the Italian government accept as part of the reparations a complete radio station which it is believed the German government is willing to send to Italy?"

From my own point of view I think that in the light of the new discoveries which Senator Marconi has just made (and complete details are known to only a few) it would be a great mistake. By accepting this complete installation Italy may be getting something which in a few months will be absolutely obsolete. When it is clearly seen how Marconi's new discoveries affect the present wireless system, then only should such a decisive step be taken.

With the settlement regarding cable concessions Italy has had a setback which will delay her reaching a state of perfection in her radio service which she had hoped to attain by now.

The Italo-South America cable will link up two continents. The Italian station will be at Fiumicino, seventeen miles from Rome. The line will pass from Italy to Malaga, the Azores, then to Rio de Janeiro before reaching the other terminus, which is Buenos Ayres. The length of the cable will be nearly 7,300 sea miles. The other cable (which will link up Italy and North America) is called the Italo-Azores and consists of a new cable from Italy to the Azores joining there to the old German cable, which was given to Italy as war reparations by Germany.

Though the thought of linking up Italy and North and South America by cable has been pleasing Italians in both continents, in reality Italy has been for the past five months connected by radio, as the new Coltano station near Pisa is in constant communication with the South American radio stations.

Few except radio experts realize that Italy has a wireless station under control of the navy which is second to none, in installation and service, in the world. The Italo-Azores Company will lay the cable at its own expense without any material help from the Italian government. As the cost of installing wireless is less than that of laying a cable it is possible that the Coltano station could cut the price of transmission so that the cable company could not make expenses, or on the other hand the cable company might cut rates to such an extent that Coltano would be the sufferer.

It is well to remember that though this company has no subsidy or guaranty, its officials must have some verbal assurance that there will be sufficient business to keep the cable from dying as soon as it is born. It would be foolhardy for any company to erect a station and lay a cable without exactly knowing how business is going to run.

Evidently the Italian government has assured this company that the Coltano station will not cut prices to their disadvantage. If so this arrangement will certainly paralyze Coltano when the cable is in good working order.

In the light of the new Marconi experiments the expense of laying cables seems preposterous when one thinks of Senator Marconi's predictions after his recent experiments. He promises that once the radio stations between North and South America have been erected a message by wireless can be sent at a cost of about seventy centimes to North America and one lira and a half to South America, thus representing about one-tenth of the amount at which the cable tariffs have been fixed.

When motor cars were first invented opposition was raised to them, and the same is true with every new invention. Progress cannot be kept back. Even the most pessimistically inclined against radio must realize that the day will come when Italy, too, must have her perfect system.

Radio World is $6.00 (52 issues), $3.00 six months, $1.50 three months, 15c. single copy. Radio World, 1493 Broadway, New York City.

Pruden Reliable Radio Specialties for Good Results

Dealers write today for our interesting proposition.

FREDERICK H. PRUDEN, Inc.
903 Bergen Ave., Jersey City, N. J.

DO YOU WANT PLANS FOR MAKING THE SLEEPER DUOTOL RECEIVER, USING THE SLEEPER TWINS, —Two Variometers and the fixed Coupler? SEND 10c for the June issue of RADIO AND MODEL ENGINEERING.

SLEEPER RADIO CORPORATION
46 W. Park Place New York City

Do You Want LONG DISTANCE on Your Set?

The following stations have been heard with a COAST COUPLER

WDAP—Chicago
CFCN—Calgary
WWJ—Detroit
PWX—Havana
WSB—Atlanta
And Many More

The COAST COUPLER is a necessary part of your radio hook up. Manufactured of the best materials obtainable and thoroughly tested before leaving the factory. It has immediately won recognition in the radio market.

ANYWHERE IN THE UNITED STATES—$5.00

Dealers and Jobbers Investigate

COAST COUPLER COMPANY
245 EAST SEVENTH STREET LONG BEACH, CALIFORNIA

"B" BATTERIES

Depleted "B" Batteries are usually the cause of your trouble in receiving. Eliminate it by buying your "B" Batteries freshly tested and passed by our laboratories—sold direct to the consumer at the following low prices—guaranteed in every respect!

	Large	Medium	Small
22½ Volt plain	$1.25	$1.00	$0.70
22½ Volt variable	$1.38	$1.13	$0.75
45 Volt plain	$2.50	$1.75	—
45 Volt variable	$2.75	$2.00	—

Any type of batteries made to order—send money order including postage—or order for C. O. D.

SPECIAL OFFER—We offer our customers a 0—50 standard Voltmeter listed at $2.75 for $2.87 with any order for batteries amounting to $5.00 or over.

ROSENDAL & CO., Chemical Engineers, 2 Stone Street, New York

CLARK INDORARIAL
Trade Mark

Indoor aerial—not a loop

Looks like a flat sheet of wall paper metal tipped like a calendar. Put it under carpet or rug or hang it back of closet out of the way—no matter where put this marvelous INDORARIAL works perfectly.

CLARK INDORARIAL POSTPAID ANYWHERE **$1.50**

RADIO WORLD'S technical editor suggests using two INDORARIALS as a set, one as an antenna, the other (two or three feet below it) as a counterpoise in lieu of a ground—"this gave perfect reception."

L. I. CLARK CO.
Manufacturers
52 East 11th Street, New York

C. B. COOPER CO.
Sales Representatives
154 Nassau Street, New York

Local representatives wanted in every large city.
Write for particulars to L. I. Clark Co., 52 E. 11th St. New York.

FILL OUT AND MAIL NOW

SUBSCRIPTION BLANK

RADIO WORLD

RADIO WORLD 1493 *Broadway, New York City*

Please send me RADIO WORLD for ..... months, for which

please find enclosed $.....

SUBSCRIPTION RATES:
Single Copy .....$ .15
Three Months 1.50
Six Months 3.00
One Year, 52 Issues..... 6.00
Add $1.00 a Year to Foreign

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DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio and other fields. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get an eight-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands eight days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office eight days before publication. RADIO WORLD, 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

SAVE $20.00—Our unwired regenerative receiver contains the best of material mounted on panel in handsome oak cabinet. Value that will surprise you, and the price is only $14.00, prepaid. C. E. Janson, 28 Bellevue St., Lowell, Mass.

STOP EXPERIMENTING—GET RESULTS with circuit used in leading WD11 tube set on market. Paragon of simplicity in design and construction. Circuit and specifications, 50c. OKAYED SUPPLIES CO., ELWOOD, IND.

FRENCH COLONIES FREE—Beautiful picture set, including Native Chiefs, Tigers, Pictorials; 2c postage. Empire Stamp Company, 351 Lippincott St., Toronto, Canada.

WESTINGHOUSE R. C. 3 tube set, like new, for sale cheap. O. Lyshang, 6 Althea St., Dorchester, Mass.

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

SECOND-HAND Westinghouse R. C. Regenerative receiver, consisting of detector and two-step amplifier, $65.00. Three Erla Radio Frequency Transformers, $6.00; Crosley two-step amplifier, $14.00. All of the above is good as new and will work with all standard bulbs. Address Randolph Whitehand, Albany, Georgia.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, tape or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

WANTED—Paragon RA-10 Receiver and DA-2 Amplifier. State best offer. Ted Boston, Marion, Ky.

15c. LETTERED BINDING POSTS, complete set eight, 60c; two sets, $1.00. Prepaid, same day. Stamps accepted. Everything in radio. Ask for quotations. List for stamp. Kladag Radio Laboratories, Kent, Ohio.

GET OUR PRICES on Plate and Filament Heating Transformers. L. Werts, 409 St. Julian St., Pekin, Ill.

FOR SALE—De Forest Portable Radiophone Transmitter. 5-watt bulbs; new, $100 net F. O. B. P. O. Box 33, Red Bank, N. J.

60,000 MILES ON A HOME-MADE RECEIVER. 2,600-mile range. 100 station log and hook-up for the asking. Maitland Roach, 2908 Columbia Ave., Philadelphia, Penn.

RADIO SET—Extremely sensitive tuner and one step in 8x18 walnut cabinet. I hear Kansas City Star; Omaha, Neb., etc. Atwater Kent parts. Complete with two WD11 tubes and phones, $70 postpaid. Address, Garth Showers, Tannersville, N. Y.

DETECTIVES NEEDED EVERYWHERE—Work home or travel. Experience unnecessary. Write, American Detective System, 1968A Broadway, N. Y.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

RAND-McNALLY RADIO MAP OF UNITED STATES—Is 28 x 30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover. Price, 35c. The Columbia Print, 1493 Broadway,

WANTED—One K. W. used Navy Quenched Spark Gap. Also Price wanted. Harvard Radio Laboratories, P. O. Box 1781, Boston, Mass.

FOR SALE—Three Radio Corporation, 200 to 5000 meter radio frequency transformers, like new, fine for superhetroydne, $5.00 each. Fine Phonograph attachments, needle operating kind. Guaranteed good as Magnavox, $10.00 each. Any of above sent post paid, collect, on receipt of $1.00. Everything sold on money-back guarantee. RAYMOND MOORE, Box 404, Lakeside, Ohio.

OLD MONEY WANTED—$2.00 to $500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. CLARKE COIN COMPANY, Ave. 83, Le Roy, N. Y.

LEARN THE RADIO CODE in 3 hours or less by the Corydon Snyder Code Method. Money back if not satisfied. 50 cents postpaid, or particulars for stamp. Corydon Snyder, 1161 So. Ridgeland Ave., Oak Park, Ill.

MAGNAVOX TYPE R3—Latest curves, improved acoustic models, in original sealed factory cartons. List $35. Introductory offer $25. RADIO CENTRAL, Dept. W, Abilene, Kan.

ALL ESSENTIAL PARTS FOR building Neutrodyne Receiver, complete instructions, etc., $21.50 C. O. D. Reinartz tuning coils, $1.50. R. Schwartz, Buchanan, Mich.

FREE APPARATUS FOR SECURING SUBSCRIPTIONS FOR "RADIO." Write today for complete list of premiums and our special subscription offer. "RADIO," Pacific Bldg., San Francisco, Calif.

VACUUM TUBES REPAIRED. Reasonable. Send for our price list. Vacuum Electric, Station C, Toledo, Ohio.

150 FUNNY PARODIES on latest songs, 25c. Book catalog, 2c. R. W. Collins Co., 197 Fulton St., Brooklyn, N. Y.

THE AMATEUR ELECTRICIAN explains the "How and Why" of electricity with plans for making and operating wireless, telephones, electric bells, toys, novelties, etc. Over 70 illustrations, 64 pages. Only 10c. R. W. Collins Co., 197 Fulton Street, Brooklyn, N. Y.

EDISON Elements for making "B" Batteries, 6c per pair; tubes, 2c each. Nickel Wire, Insulators and Cabinets at reasonable prices. TODD ELECTRIC CO., 178 Lafayette St., New York City.

RADIO FANS

Do you want to sell your old set?
Do you want to exchange anything for something?
Do you want to buy something?

If so, why don't you use the Classified Department of Radio World? You can get fine results for five cents a word, minimum ten words. Your message will reach thousands including other fans, dealers, etc., etc.

Try Radio World's Classified Department for your personal radio and other needs.

RADIO WORLD, 1493 Broadway, New York City

AMATEURS! FANS! ATTENTION!

ALL BROADCASTING STATIONS—Complete with the call, location, wave length, frequency of the station, and power used started in Radio World of June 9.

This list is most complete, and no amateur or fan should be without it. It will be completed in following issues, and as revisions or changes are made the list will be kept up-to-date, so that you will always have an up-to-date list to which you can refer. Don't miss any issue. Send 15c to

RADIO WORLD, 1493 BROADWAY
New York City, or start your subscription with that number.

DO IT NOW—DON'T DELAY!

Preparing for the New School Term

Radio World wants a representative in every grammar, high and preparatory school in the United States and Canada.

We have a special proposition that will enable representatives to make money. Appointments made now. Give name of school you will attend in the Fall.

Address Circulation Dept., RADIO WORLD, 1493 Broadway, New York City.

DID YOU GET THE VACATION NUMBER OF RADIO WORLD

It had page after page of interesting and practical ideas and hook-ups for people who are going camping, canoeing, yachting, or just vacationing up in the mountains. You really can't afford to be without it. If you intend leaving the city behind this summer and want to take your radio with you. Dated June 2. Mailed the

COME IN AND GET BIG VALUE!

FOUR REASONS FOR ADVERTISING IN RADIO WORLD'S FALL BUYERS' NUMBER

1 At four dollars an inch (yearly contract rate) 74,000 radio-buying readers learn of your goods—a greater number of eyes than four dollars can reach in any other radio advertising medium.

2 Radio World gives **quicker results**—i. e., advertising copy received by Thursday p. m. is published and on the news-stands the following Wednesday morning.

3 A Weekly has greater **reader interest**—the Saturday Evening Post, Literary Digest, Iron Age, are Weeklies. Radio World, the big success of radio, is published every week.

4 Advertising is a gamble. Life itself is. A gambler bets his money on past performances. Radio Corporation of America tried out **Radio World,** then gave us a yearly contract. Magnavox tried us for small space thirteen times, and have just renewed for fifty-two times, using pages. The Federal Telephone & Telegraph Company investigated us from every angle for weeks, then gave us a fifty-two consecutive issue order. A four-time trial of Radio World almost invariably ends with a fifty-two time contract at $120 per page net or $4.00 an inch.

DATE OF THIS IMPORTANT ISSUE—OCTOBER 6

(LAST BLACK FORM CLOSES SEPTEMBER 27)

Special service and value to advertisers in Radio World's **FALL BUYERS' NUMBER:** All advertisers who give us copy for quarter page or more space in Radio World's **FALL BUYERS' NUMBER** will, on request, have their announcements appear in **two colors at the price of one**—in case copy is in our hands by September 24.

Write, wire or phone now for special positions

RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

TELEPHONE LACKAWANNA 6976

Special Editorial and Pictorial Features will make this FALL BUYERS' NUMBER of extraordinary interest and value from the reader's standpoint.

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Another Use For Loud Speaker

When the static is too great for radio reception your AUDIOPHONE Loud Speaker can be used with the Bristol Phonograph Record Reproducer on your phonograph. Then you may have concert or dance program without interruption.

Attached instantly without mutilating the instrument in any way—the Bristol Phonograph Record Reproducer can be used with any make of phonograph. Equipped with such an outfit there are no disappointments—it is always ready—never fails. For dance music you have the equivalent of an orchestra, but without the expense.

The tone of the phonograph thus amplified thru the AUDIOPHONE has volume enough to fill large rooms and the quality is round—smooth—and beautiful—entirely free from mechanical noises.

Remember that the same AUDIOPHONE Loud Speaker is used in common for both radio reception and phonograph record reproduction.

A LOUD SPEAKER and REPRODUCER IN ONE

BRISTOL AUDIOPHONE

MORE THAN A LOUD SPEAKER the AUDIOPHONE is a real reproducer of the original broadcasting. It is easy to listen to the Audiophone reproductions because they are so perfect. The speech, songs and instrumental music are not blurred or disguised by mechanical distortion. You get all the fine shadings and every inflection. In fact, the very personality of the artist seems to be present as you listen.

DEVELOPED in the laboratories of an engineering firm known the world over for recording instruments of precision.

COMPLETE in every way and ready to connect to the receiving set.

NO AUXILIARY BATTERIES are required for magnetizing.

ADAPTED for use on all types of two or three stage power amplifiers.

MADE IN TWO MODELS:

BRISTOL AUDIOPHONE SR. Loud Speaker, Size of Horn 15-inches Diameter, Price..... **$32.50**

BRISTOL AUDIOPHONE JR. Loud Speaker, Size of Horn 11-inches Diameter, Price..... **$22.50**

THE BRISTOL SINGLE STAGE POWER AMPLIFIER can be furnished for use with the usual two-stage amplifier and will greatly increase the range of the Audiophone Price..... **$25.00**

Write for Bulletin 3006-W.

THE BRISTOL COMPANY

WATERBURY, CONN.

BOSTON NEW YORK PHILADELPHIA PITTSBURGH DETROIT
CHICAGO ST. LOUIS SAN FRANCISCO

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SIMPLIFIED FLEWELLING CIRCUIT (See Inside)

15c. a Copy September 22 $6.00 a Year

RADIO WORLD

Title Reg. U. S. Pat Off.

ILLUSTRATED EVERY WEEK

THESE ROMANY PEOPLE APPRECIATE RADIO BROADCASTING

(C. Gilliams Service)

Although they still retain the customs of their ancestors, these modern gypsies have proved that they are up-to-date as far as the comforts of modern conveniences can make them. They use an ultra-modern radio receiver that works on a loop, with dry cell battery tubes. After the long day's trek over country roads, these roaming nomads gather around the set, much the same as they used to gather around the musically inclined members of their tribe, and listen to the news of the day and some good dance and vocal numbers. The particular group of gypsies pictured here were caught listening in on the baseball scores while camped near Newark, New Jersey.

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Grewol
THE PERMANENT DETECTOR

FIXED ADJUSTMENT

The Grewol is adjusted on the most sensitive spot on the crystal and fixed—proof against vibration and jar. Protected from dust and moisture by glass enclosure. Grewol adds to the efficiency of reception.

Packed in individual carton with instructions. **$2.00**

Write for Booklet

Randel Wireless Company
5 Central Ave. Newark, N. J.

The Wireless Oracle

By Hirsch M. Kaplan

Say did you hear what the regular announcer of station WHN had to say the other night? If you didn't, here goes for an earful. "The mechanical equipment of our station is being improved daily." Yes, we've already noticed that. "And, within a very short time our station will be equipped with the best equipment possible. We are aiming to make station WHN the most powerful station in the country besides offering the best programs obtainable."

You sure are there with plenty of volume WBAK. Do you ever broadcast a regular program?

While listenin' in for DX have you ever missed the call letter of a station only to hear them say "Tulip Town"? Well, just to enlighten you, that was station KDZR of Bellingham, Wash.

The people of Newark, N. J., ought to be proud of having a station like WAAM. Compared to the size of the town and the population of this burg this station is keeping pace with most of our larger stations. The popular program as offered by Mr. Hanbury the other night was great stuff!

Somehow or other we can't get excited over "lyric sopranos" on the air. The girls try hard, and they must be good or they wouldn't get the chance to do their stuff, but it certainly doesn't come in so wonderful.

The Oriole Orchestra, from Chicago, came through kinda mushed up, but the announcer from WJAZ could be heard distinctly with the phones held ten inches from the ears. Walter Graham, my second "op," thinks that they were the bees' knees.

WMAF again helped us to spend an enjoyable evening by offering the West End Ladies Trio. Programs of their sort are never tiring.

Although Nat Sanders and his popular program was the berries, his impersonation of Jimmy Sheares' song, "Hot Roasted Peanuts" was poor.

By the way have you noticed how popular Jimmy Sheares' hit has become? Only the other night I heard three orchestras, two pianos, five popular singers and one violinist play that number.

We have it fresh from the post office that our "Friend Henry" has decided to erect a broadcasting station at Dearborn, Mich., that will reach to every corner of the country. Preparing for the 1924 campaign, Hank?

The Hotel Adelphi's Roof Garden Orchestra through WOO would make a wooden image do a "can-can."

WBS, can't you get in stride with the steps of progress that radio has been and is taking? Your modulation and phonographic programs are still rank.

We can well believe that story about static starting in Mexico. Every time we swing our loop in the direction of WIP we pick up more than our share of those joy-killing sounds.

There seems to be great competition among the dance orchestras of our various ocean liners. First we had Paul Whitmen's S. S. "Leviathan" orchestra, then the dance orchestra of the S. S. "Berengeria," and the other evening we had the orchestra of the S. S. "Paris." They all provide such sterling entertainment that it would be very difficult to proclaim one better than the other.

WAAM, although a small powered station and on a low wave, still make themselves conspicuous by their popular programs, through a station that ranks with the best. That's the stuff. You sure do set a fine example for your complaining brothers.

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45 Volt variable	$2.75	$2.00	—

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VOLUME THREE OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

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An Anti-Interference Circuit

By C. White, Consulting Engineer

AMATEURS who are complaining as to the non-selectivity of the circuits they are now using, are advised to pause and take a good look at the circuit herewith described. We have all heard of the four-circuit receivers and all the others that make such marvelous claims for selectivity. Here is a double circuit with the addition of a double wave-trap circuit, that virtually makes it a four-circuit selector. If this circuit does not eliminate interference in nearby or interfering stations, the case is helpless. With this circuit one should be enabled to tune out two stations above and below the desired station, and hear the desired station whether it is DX or local. The circuit has been tested and works to perfection as a selective circuit.—Editor, RADIO WORLD.

WE are constantly searching for the ideal circuit but with every circuit there is some drawback that makes it non-acceptable under certain circumstances. To me it seems that the problem nowadays is to get greater selectivity and more quiet operation under all conditions.

There are many excellent ways that we can accomplish this, but in so doing we must be guided by the financial side. A multi-tube set has the disadvantage of rather high maintenance cost, such as tube renewals, batteries, etc. Then, on the other hand, a single tube must needs be limited for many reasons from performing well under all conditions.

The great question sums itself up as to how we can get sensitivity and selectivity with a single tube and no radio-frequency amplification. I do not intend completely to answer that question. If I could I would be more than glad to write it up, but I will say that we can go a long distance toward the ideal by improving your circuit from time to time in the many ways that are constantly being suggested in RADIO WORLD. It will pay you to keep close track of these.

The circuit I am going to outline is a combination of the Reinartz idea of regeneration, tickler regeneration and a multiple filtering method. An anti-capacity switching arrangement allows you to choose either type of regeneration that is best adapted to your needs and the two filtering circuits allow you effectively to cut out any two stations that are causing considerable trouble. It has been my general experience that interference is often two-fold and a filter that is capable of only cutting out one station and not the other interfering station only half does the trick.

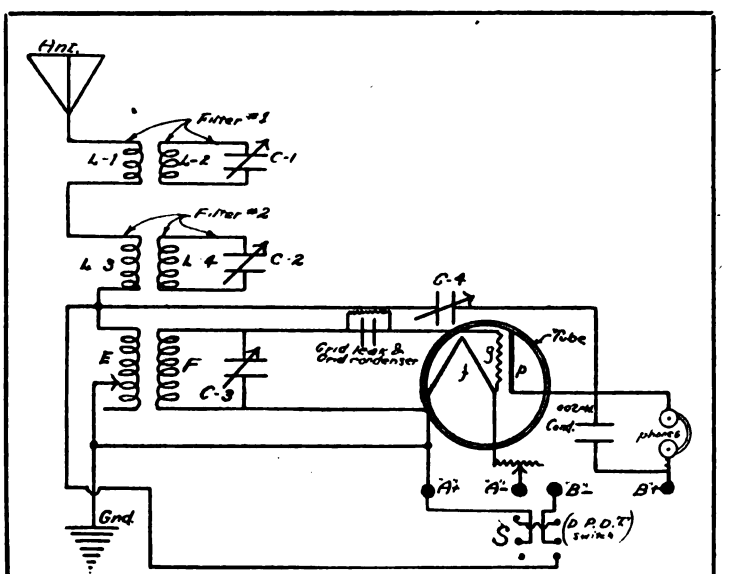

Diagram of a circuit that is ultra-selective. The selectiveness lies in the four inter-coupled selector coils as shown by L1-L2, C1; L3-L4, C2, and the addition of the condenser C4. If constructed according to the directions and carefully made, absolute selectivity is possible.

After looking at the diagram I guess you will think there are too many expensive condensers in the circuit, but if you already have some condensers on hand you will only have to purchase a few new ones, since the condensers in a few places in the circuit are very flexible as to size. And besides it is well worth the extra trouble and expense to get a set that is remarkably free of interference and noise.

In constructing the receiver you must adhere fairly close to the assembly details in order to get full advantage of the circuit efficiency. It is quite obvious that a cabinet larger than the customary size must be used for this tuner. Do not try to crowd the wiring detail in the ordinary single tube cabinet. For example, the filtering circuits, L-1, L-2, C-1, L-3, L-4 and C-2, must be assembled separately in a shielded compartment in order to prevent inductive coupling between the L-1, L-2 and the L-3, L-4 group of coils. A shielded partition can easily be made of copper foil mounted on a thin wooden partition. Then, again, there should be a similar partition between the filter L-3, L-4 and the main tuning coil E-F to prevent inductive coupling. The panel of the set should be covered with copper foil on the inner side, and all the grounding pieces of copper foil should be electrically connected together and attached to the ground terminal of the set. It is advisable to have all wire insulated with spaghetti, especially where the con-

(Concluded on next page)

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Stopping Autos and Airplanes by Radio Officially Denied

WASHINGTON, D. C.—Public antipathy against Germany's war plans of the future should not be increased by the report from Berlin that the German Government can stop and render powerless automobiles, airplanes or other motor vehicles by radio. Herr Prostrat Hermann Thurn, an administrative head of the German wireless service, dismissed the stories as "so much nonsense," in an interview sent officially to Washington. He further stated that the correspondent who sent the dispatches to papers in the United States to the effect that in June a number of automobiles en route to Hamburg were halted when their magnetos were stopped by powerful radio waves from Nauen, was the victim of unscrupulous persons. "No such achievement has yet been anywhere reached," the German engineer asserted, adding that even if it had been attained by Germany, "it would have most certaily been kept a secret and not bruited about by anybody connected with Nauen."

This official information also discredits the stories that airplanes of France flying over Bavaria were stopped and forced down by radio waves from German stations.

Both stories of radio magneto control are impossible, according to the German radio expert, who pointed out that: Magnetos are enclosed in iron or steel jackets and could not be influenced by radio waves; no matter how powerful, radio waves cannot be directed with precision so as to affect the magneto of a vehicle or vessel at any distance from the directing station, particularly when the vehicle is in motion; and that are definite or precise directing cannot be achieved, every vehicle or vessel within the zone of influence of the electrical wave would be similarly affected. This would stop, bring down or sink the vehicles or ships of the operating agency as well as those of the enemy.

Some skeptics may believe that the Herr Administrator would have denied the statements in an effort to protect Germany's secret radio control, but the official forwarding the dispatches believes implicitly in this radio engineer, whom he knows personally and professionally, and he feels that his negations and criticisms should be taken without reservation.

An Anti-Interference Circuit

(*Concluded from preceding page*)

necting wire passes through the grounded partition on to the compartment on the other side.

The condensers, as I have said before, are the big items of expense in making this tuner, and therefore you should use care in purchasing the right kind as to quality. Nothing but very high grade condensers ever give satisfactory results in a radio circuit. There are plenty of good, high grade condensers now on the market and you will have little trouble to find one.

The coils in this circuit can be readily wound at home with No. 22 S.C.C. magnet wire. After finishing each coil it is advisable to shellac it, taking care to cover it with only a thin coat, since too much shellac increases the capacity of the windings, thus destroying sharp tuning. Now as to the specfications of the various units. You will notice that each group of inductances consists of two separate coils. The coil in the Ant.-Gnd. circuit is always wound on the larger size 4 inch tubing, while the coil on the other side of the circuit is always wound on the smaller size tubing (3½ inch). Of course, the size of the coil tubing can be varied slightly without any detrimental effect just so long as one tube is large enough to slip snugly over the smaller one in much the same manner as the two coils in the air core transformers used in the "neutrodyne" (called "neutroformers"). In figuring the length of tubing to cut off for each coil it is good to figure about 20 turns of wire to the inch for No. 22. Using the 20 turns as a basis, the tubing holding the coil L-1 and L-2 should be 3 inches long because L-2 has 40 turns of wire and allowing for end space 3 inches will be just right. Although the coil L-1 has only three turns of wire, it is wound on the same length of tubing as L-2 in order to make the ends of the two tubes fit flush when slipped over each other to make the complete inductance unit. The coils L-3 and L-4 are identical to L-1 and L-2, that is, the primary having three turns and the secondary 40 turns. The unit E-F is assembled in the same manner as the filter coils. It differs in that the coil E has 50 turns with taps for switchpoints at every fifth turn. The coil F, which is wound on the smaller size tube, has 50 turns, untapped.

The condensers C-1 and C-2 can be either 11 or 23 plate air variables, the 11 plate size being the better for this particular use. The condenser C-3 should be an 11 plate type with a venier, while C-4 should be a 23 plate condenser. It matters little how the movable and fixed plates of C-1 and C-2 are attached in the receiver, but the condenser C-3 should have the movable plates connected to the ground side of the filament-grid circuit. C-4 works better when the movable plate side is connected to the Ant. side of the circuit; that is, the fixed plates are directly connected to the plate of the tube.

Although I have shown the circuit with detector tube only, the circuit is easily adaptable for use with the ordinary two-stage amplifier. You are free to use any tube in this circuit you so desire as long as you select the proper size filament rheostat and grid leak and condenser to go with it. Do not try to work a 201-A tube with a grid leak that has been made or adjusted to work efficiently with the UV200.

Just a word about the 201-A tubes. I have been recently using these tubes as detectors and find that they give results equal to the 200 under all conditions provided the correct grid leak is used. Taking the fact into consideration that the 201-A is not as critical on the filament adjustment leads me to think that it is better as far as manipulation is concerned. Splendid results can be obtained with the new UV199 tubes in this receiver.

In tuning remember to set C-1 and C-2 at zero capacity. These condensers are used to tune out interference only and nothing else. The switch S is a D. P. D. T. anti-capacity switch (made by Federal Tel. & Tel. Co.) and is used to select the type of regeneration desired. If you fail to obtain regeneration when S is in the down position reverse the terminal connections to the coil F.

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Commercial and Naval Radio Services to Japan Are Open

By Carl H. Butman

WASHINGTON, D. C.—The Japanese calamity, which practically wiped out Tokyo and Yokohama and broke the Pacific cable, gave radio another opportunity to demonstrate to the world its value of international communication, especially in the event of emergencies when land lines and cables fail. Without the single radio communication link left at Iwaki the world might have been without details of the Japanese disaster for as long as a week. Bits of news and imperative information would have been put through by cable, but radio is said by Secretary Hoover to have literally saved the day in bringing in relief as well as in carrying out the news.

To be sure, the first brief message of the disaster came to the Japanese Ambassador at Washington by cable from Nagasaki via London—out of the back door of the East, as it were, and over cables estimated 15,000 miles long. The Pacific Commercial cable from Japan to Bonin Island, reported submerged, and thence to Guam, was put out of service by the earthquake. Messages are now routed east via Manila, Shanghai and Nagasaki, or west via London.

It remained for radio to carry most of the official dispatches and news reports across the Pacific to North America, and radio, aided by the remaining cable connection of Nagasaki, has handled a tremendous amount of traffic. The Japanese government station at Iwaki, or Tomioka, stepped into the breach and the world now knows of the excellent service rendered by the Japanese operator who stood a long watch alone. His call and messages on the disaster were picked up by the Radio Corporation's station at Bolinas, Cal., and relayed to all points in the United States. Iwaki, which is about 144 miles from the stricken cities, for some time had no means of communcation. At the suggestion of the Japanese Ambassador at Washington, however, a courier service was established to Tokyo and now a regular schedule is in operation. A statement that communication was open to Tokyo, by the State Department, led some to believe that line wire communication between the station and Toyko was established. However, communication used in the old sense means that the roads were open. According to the latest reports no wires have been re-established. Since the advent of radio, it seems that a new word must be substituted for "communication" when referring to roads and other lines of transportation.

Radiograms are now accepted for all points in Japan, except Tokyo and Yokohama, being mailed from Iwaki. Messages for these two cities are subject to delay.

Radio was the means of getting the first authentic account of the disaster to the new world on September 4. The master of the S.S. "President Jefferson" radioed to his Shanghai office from the port of Yokohama direct. The American Consul put the message on the cable for Secretary Hughes in Washington. Facts relating the unsafe condition of the harbor at Yokohama were immediately broadcast by the Naval Hydrographic Office here that all ships might be warned of the hidden dangers there, the absence of lights, etc., radio again serving in its most valued capacity, that of protecting life at sea.

The United States naval forces in Japanese waters are rendering official emergency service via radio. The American Asiatic Fleet is now at Yokohama and the destroyer "Borie" is stationed at Nagasaki as a radio relay ship. Messages from the American flagship are

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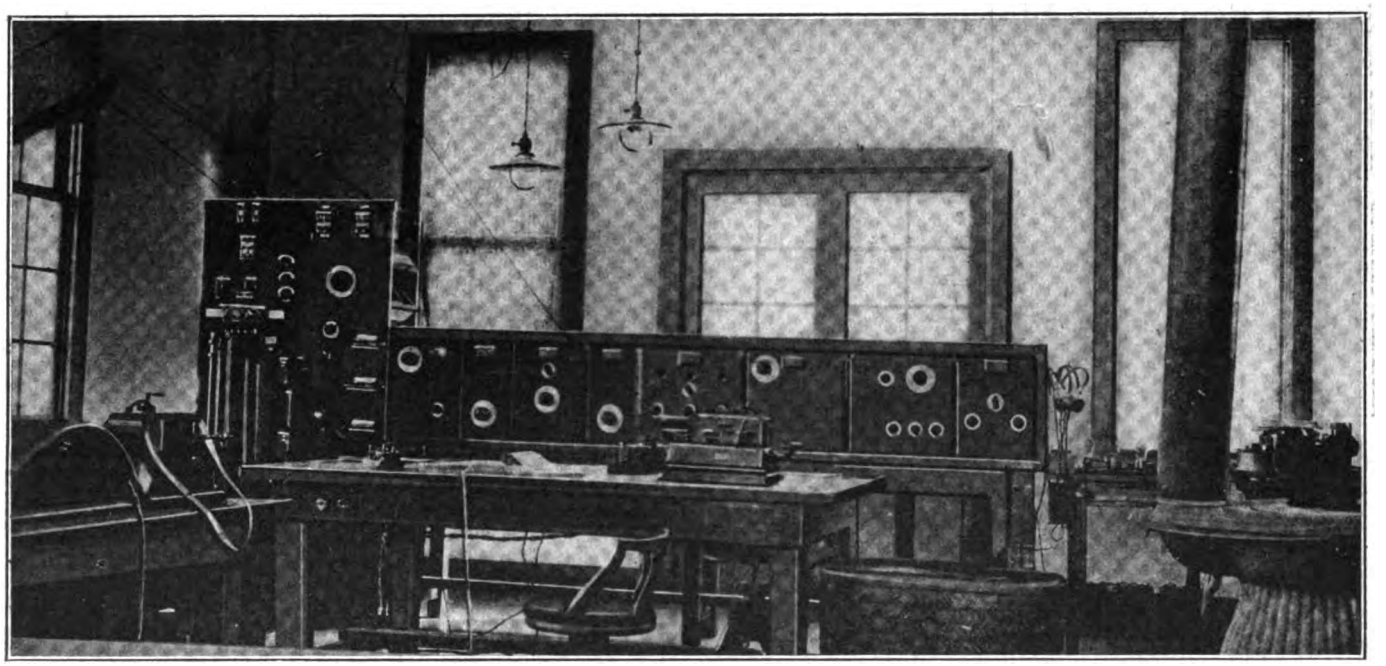

(C. Fotograms)

The transmitting station at Haranomachi, Japan, which gave the world the first meagre details of the terrible earthquakes. It was from this station that the operators broadcast all the later details, and was the only means of communication between Japan and the rest of the civilized world. All the cable systems were either ruptured, or put out of commission by having their shore ends destroyed in the stricken district. The transmitter is remotely controlled from the Tamioka station, which is 178 miles from Haranomachi. Both are considered as one plant under the name of the Iwaki radio station.

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First American Built Dirigible Equipped with Radio

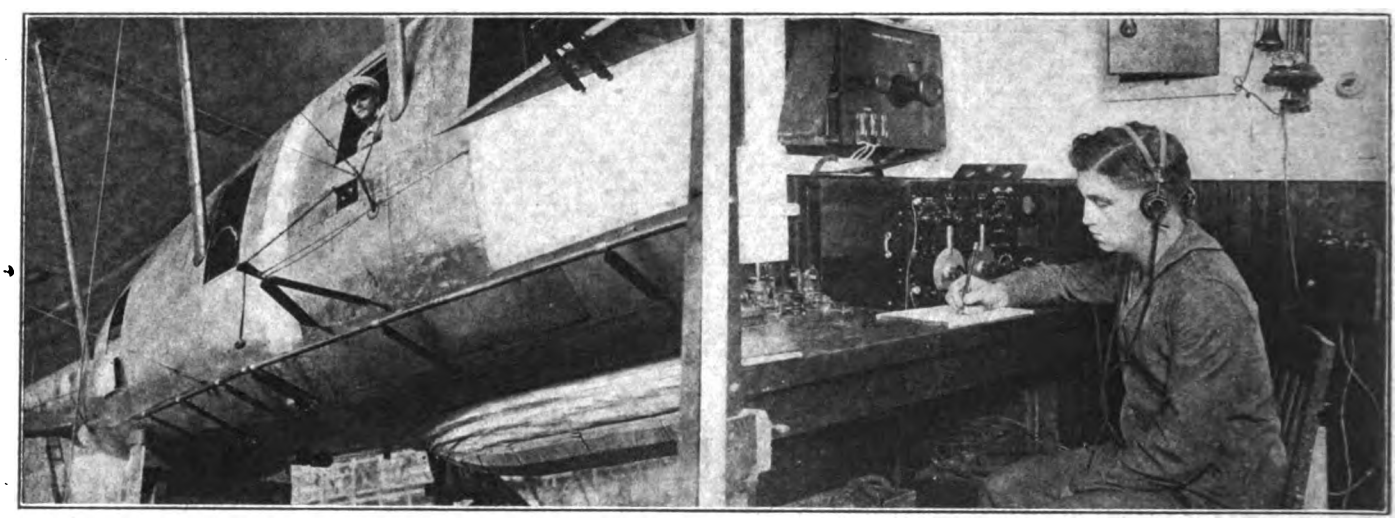
UP to the present time, the American aeronautic forces of the Army and Navy have not paid much attention to dirigible or lighter than air craft. However, there has been under construction by the navy at Lakehurst, N. J., the largest rigid type "lighter than air" craft that has been attempted in America. The only other nation that has attempted with success the construction of this type of airship is the German, famous for the Zeppelins.

The advantage of this type of aircraft in patrol and other work is the fact that it does not have to keep moving at all times but can remain stationary at different heights, or drift with the air currents. This gives the plots and observers greater chance to chart and observe the particular district over which they are flying. In airplanes this is so far impossible, as they have to keep moving. The ZR-1 is a most thoroughly equipped craft. It is capable of extremely long journeys, as the fuel used can be stored in the cupolas meant for that purpose and also because of its ability to drift with the varying currents of the air.

Paramount in its electrical installation, however, is the radio apparatus. The transmitter is a three KW. C. W. transmitter and an up-to-date navy type receiver, especially designed and built for this particular installation. Due to the fact that a trailing type of antenna is used, and the metal work of the dirigible is used as a ground or counterpoise, the receiver was designed especially for this type of work.

The initial flight of this monster of the air demonstrated its practicability, and during the series of successful trial flights, it kept in constant touch with its home base through radio, advising of the operation, speed and action at varying heights, thereby allowing the observers on the ground to accurately note its action from a distance.

Radio in airplane flights is a past performance, but this is the first time that an American lighter than air craft has been equpped with radio, especially as powerful an apparatus as that installed in the ZR-1. This power and its especially constructed apparatus will enable it to send and receive over much longer distances than has been done heretofore by airplanes, which are naturally limited as to space, and therefore cannot install powerful apparatus, which takes up space and is heavy.



(C. Both photos Kadel and Herbert)

The radio gondola of the dirigible ZR-1 showing the trailing antenna, with the heavy weight attached to prevent its flying back and entangling itself in the controls. John T. Robertson, radio operator of the ZR-1, observing the camera man at work. Current for the operation of the powerful transmitter is derived from a wind driven generator located at the fore part of the radio gondola.

The home station of the ZR-1 at Lakehurst, N. J., receiving reports from the craft while it was in the air. The receiver is the latest type naval apparatus, comprising three stages of radio-frequency, detector and two stages of audio-frequency. The transmitter is remotely controlled by means of relays, and this station and the ZR-1 during flight are constantly in communication.

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picked up by the "Borie," relayed to the naval radio station at Cavite and thence to the naval station at San Francisco. Government west bound messages are sent from Washington via Annapolis radio station or commercial land lines to San Francisco, where they are relayed via Honolulu, Guam and Cavite to the "Borie" and thence to the American fleet off Yokohama. The U. S. S. "Sacramento" is stationed at Woosung, China, to relay radio messages.

Many radio experts feel that the terrible disaster and the severing of communication out of Japan will aid materially in establishing better radio service between Nippon and the world. The policy of the Japanese government has been to control radio, although American commercial companies have been endeavoring to provide better stations and transmission.

Is It Home-made Static?

NOW that the cooler weather is coming on, lots of fans expect a decrease in static and are much disappointed when they do not find it so. Do you realize that noises exactly like static, and probably louder and longer are often caused by faulty B batteries? To test it out, turn off your detector tube, stick your jack in the last tube of your amplifiers, and turn on your amplifier tubes full. You will then discover just where your "static" is coming from. The remedy, of course, is to find out just which set of batteries is causing the disturbance and to remove them.

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One Thousand Amateurs at A. R. R. L. Chicago Convention

THE second national American Radio Relay League convention opened at Chicago on September 12 with a registration of approximately 1,000 delegates.

The banquet in the evening at the Hotel La Salle was splendidly attended. An inspiring message was read from Hiram Percy Maxim, president of the league. Addresses also were made by other officers and members of the board of directors, as well as by officers of the Chicago Radio Traffic Association who are directing the affairs of the convention. Another prominent speaker was W. D. Terrill, chief supervisor of radio, Department of Commerce.

The diners enthusiastically welcomed the distinguished French radio amateur, Leon Deloy, and A. H. Krussell, a Canadian amateur. The convention, therefore, took on an international aspect, a most encouraging development.

Dr. Lee De Forest, the eminent radio pioneer, is returning to the United States on the S.S. "Leviathan." The delegates cheered the reading of the following message from Dr. De Forest, which was radioed from the "Leviathan" to the banquet hall:

"Radio will have a continually expanding influence on the welfare of the world. It will make people happier through its entertainment utility, healthier by its spread of information, and better through its power to promote understanding."

Major White Gives Dempsey a Lesson in Radio

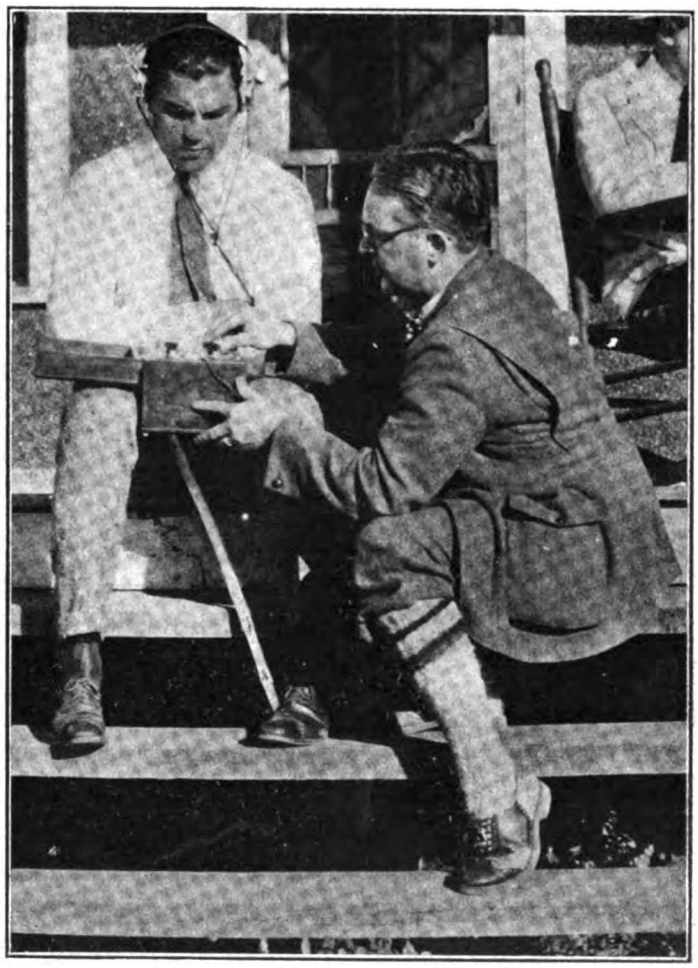
MAJOR J. ANDREW WHITE, who broadcast the Dempsey-Firpo fracas recently held, visited Jack's training quarters at Saratoga a few days before the fight and showed him how to work a portable receiver of the type that hundreds of interested fight fans and broadcast listeners would use to hear the ringside returns that Major White was to announce from the ringside.

Dempsey, while not a fan himself, understands what it means to thousands of fight fans and listeners who would not be able to get to the championship battle, to hear a blow by blow account of the fight, told in Major White's interesting and terse manner.

Another point of interest in the fight is that thousands of South American supporters of Firpo had sets installed so that they would be enabled to hear the instant returns of the battle.

The illustration shows Major White instructing and explaining to Jack the why and wherefore of the different dials on the Aeriola, Sr., that he is using. It is not stated whether Dempsey assimilated the technical explanations as well as he can interpret a left hook to the jaw followed up by a right cross to the bread basket, but by his expression it evidently puzzles him.

In the large cities thousands of people who could not get to the fight and who did not own sets, stood outside radio stories that had loud speakers and got the returns "hot off the griddle."



(C. Radio Corporation of America)
Major J. Andrew White Explains a Radio Set to Jack Dempsey

To Save Money

MANY sets use potentiometers across the A battery leads of the first tube, on the battery side of the rheostat. When you turn off for the night you simply turn out your tubes and forget about it—unless you are wise. Then you realize that your battery is constantly discharging across the potentiometer all night and you disconnect your battery leads from the set altogether. Four hundred ohms is a lot of resistance, but even at that it will shorten a battery's life considerable by leaving it in the circuit.

MacMillan Party Safe

A PRESS dispatch from Prince Rupert, British Columbia, Canada, states that Captain Donald B. MacMillan, Arctic explorer, and the members of his expedition who sailed from Wiscasset, Me., last June aboard the auxiliary schooner "Bowdoin" are well and safe at Etah, on the northwest coast of Greenland, according to a radio message picked up there by Jack Barnesly, an amateur operator.

The "Bowdoin" will winter at Flagler Bay, the message said. A foot of snow was reported.

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Radio Successfully Aids Aviation

By Carl H. Butman

WASHINGTON, D. C.—Radio, the latest "wonder of the world," is materially aiding the development and efficiency of military and naval aviation. War-time flying in its many phases, would avail little to the commanders-in-chief if instantaneous communication between the bases and the air fleets was not constant. Radio telegraphy and telephony establish direct liaison between the air and the ground or sea, thus combining these arms of the service.

Peace-time tests and maneuvers between the aerial forces and those of the land and sea aided by radio are carried on regularly by both the army and navy; their scope and frequency are being extended each year.

A recent army air service report from France Field, Canal Zone, states that during the past fiscal year 261 radio flights were made, embracing aerial radio tests, voice-controlled formations, coast and field artillery reglages or gun-fire observations, tactical maneuvers, reconnaissances and coast patrol work. This was an average of a radio flight each working day. The diversity as well as the volume of radio communication accomplished in the Canal Zone was in excess of any previous year but will be extended next year, the report states. France Field pilots had never before attempted tactical maneuvers, coast patrol, field artillery spotting or voice-control formation flying, yet the report indicates successful results in all lines where radio was used.

More radio test flights are necessary, the report recommends, as constant testing is the only means of keeping radio equipment in first-class condition, particularly under the severely corrosive climate of the tropics. Furthermore, the training and experience of pilots through regular use of radio is held of utmost importance. Following maneuvers with the naval fleet and demonstrations at Balboa Flying Field, weekly voice-control flights, in which the pilots receive their instructions and orders by radiophone from their commander in the air or on the ground, were recommended in order to improve and train the flying personnel in airplane tactics and radio communication.

Coast artillery spotting held last fall proved far superior to any held in the Canal Zone, not only in point of reliability and efficiency of two-way radio-telephone communication, but also in the extension of the ranges at which this two-way radio communication was carried on. The Air Service, called upon by the Coast Artillery Defences of Cristobal and Balboa to spot their fire for three coast artillery stations, carried out 49 radio-telephone flights, all of which, according to the coast artillery, were eminently successful.

The first attempt to use two-way radio-telephone to spot firing for the field artillery was at Gatun. A radio operating truck, type SCR-108, was sent to Gatun and used as a mobile ground station. This truck was connected by field telephone lines with the battery commander's station direct. The results were very satisfactory and highly commended by field artillery officers. Four field artillery officers were utilized in spotting fire from the air. After 30 minutes of instruction in the use of the radio telephone they were qualified to operate the radio-telephone set in the airplane during the flight and adjust the fire of their battery.

The value of radio-telephone communication in giving and receiving instructions in the air was clearly demonstrated when France Field sent all of its planes and flying personnel to the Balboa Flying Field for inspection and maneuvers. The success indicated what should be expected with more improved radio telephone and telegraph sets operating with ground radio sets of higher power, it is stated officially.

During the U. S. Navy maneuvers in Panama Bay, the air service was called upon to do special reconnaissance work and to patrol the Pacific Coast for a distance of almost 100 miles to the southwest. That two DH4B airplanes, equipped with SCR-73 spark sets were able to send position reports in the air from Aguadulce, Panama, a distance of approximately 80 miles, to the France Field radio station through interference, was a feat never accomplished before. SCR-68 radio-telephone sets on Martin bombers successfully sent position reports on two occasions by voice and buzzer modulation from Pearl Islands to France Field, a distance of almost 100 miles. The SCR-73 spark sets, it is believed, could send from the air to France Field, approximately from 150 to 200 miles, without much trouble. When installed on Martin bombers they should approximate a range of about 300 miles, it is estimated.

United States Radio Conferees Announced

THE United States committee of electrical and radio experts representing eight governmental departments having to do with radio and other electrical communications has just been announced by the State Department. This committee, headed by Under Secretary Phillips of the State Department, will meet at an early date to consider the plans and policies of this Government on matters pertaining to international electrical communications.

The agenda prepared by the committee will become the basis for the United States' report to the Fourth International Electrical Communication Conference when it is held in Paris. It is probable that the American delegates to the International Conference will be selected from the personnel of the committee, but as no date for the general conference has been set, the State Department has not made announcement of its representative or plans. The international conference was to have been held this spring but was indefinitely postponed. The United States governmental representatives are: State, William Phillips, Under Secretary, Chairman; Treasury, Lieut. Zeusler, U. S. Coast Guard, and Constructor Walton, alternate; Army, Maj. Gen. George O. Squier, Signal Corps, and Maj. W. E. Prosser, alternate; Postoffice, Second Asst. Postmaster General Paul Henderson; Navy, Rear Admiral W. R. Shoemaker, and Commander D. C. Bingham, alternate; Agriculture, W. A. Wheeler, and E. B. Calvert, alternate; Commerce, Solicitor S. B. Davis, and P. E. D. Nagle, alternate; and U. S. Shipping Board, L. L. Lee.

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A Simplified Flewelling Circuit

By Le Roy Western

TO those interested in super-regeneration and circuits giving a similar effect to the Armstrong super-regenerator, the Flewelling circuit offers quite a large and interesting field for experiment. The writer has done a considerable amount of work along these lines, starting with the three-condenser Flewelling which was first brought to the attention of the radio public and then working along lines more or less original with himself.

The diagram herewith shows one of the most flexible circuits, in the writer's opinion, which makes use of the unique condenser arrangements for obtaining a variation frequency. This set, as will be seen, is exceedingly simple in construction and instead of the usual bank of three condensers, makes use of only a single fixed condenser. This latter is not very critical as to capacity and the writer found that capacities of from from .003 to .006 mfd. gave excellent results.

The grid condenser and leak should be given a great amount of attention and should be carefully selected. The condenser may, if desired, be fixed at a capacity of about .00025 mfd. but much better results will be obtained if a good standard make of variable condenser with a maximum capacity of .0005 mfd. is used. The grid leak should be constantly variable from one-half to five megohms and should be of very good construction in order to eliminate loose contacts and other objectionable features which would tend to cause noises in the circuit. Any extra time which may be spent in the construction of this variable grid leak will not be wasted as the results will amply repay the builder.

In regard to the tuner, the author would advise the use of two honeycomb coils, coil P having from 50 to 75 turns wound thereon, while coil S should have at least 100 turns. If in the course of construction, the builder finds that he does not have honeycomb coils of the required size, a standard variocoupler may be impressed into service and rewound so that the primary has about 75 turns, tapped every 10 turns for its entire length. In this case the rotor should also be rewound so as to contain approximately 100 turns. In the case of honeycomb coils, the primary coil P should be shunted by a small variable condenser with a capacity of approximately .0005 mfd.

In one of the writer's experimental sets, a standard variocoupler was used without rewinding. In this case, it was found advantageous to connect a variometer in series with the rotor as indicated in the diagram herewith. If, however, honeycomb coils are used or the variocoupler is rewound, it will be unnecessary to use a variometer, although the builder is advised to experiment with the connection in order to ascertain just what will give the best results.

A switch arrangement at A and B was installed by the writer when using the Flewelling circuit so as to afford flexibility in connections to the primary. By means of the two single-pole double-throw switches, it is possible to connect both the aerial and ground to the coil P, or to use the ground or the aerial alone, and to connect either one of these to either side of coil P. This afforded extreme flexibility in experimenting with the set as it was unnecessary to undo connections in order to find out just where the aerial or ground should be connected. It was found that when either one was to be used alone, best results were obtained when it was connected to the side of coil P which is in turn connected to the grid. In some cases it is possible to use both antenna and ground on this set although usually excellent results are obtained with the former alone.

The tube used in this circuit should be of the hard variety, although the WD12, UV199 and UV201A will all give excellent results. The "A" battery voltage will depend entirely upon the tube used and the "B" battery voltage should be experimented with in order to find out what value will give the best results.

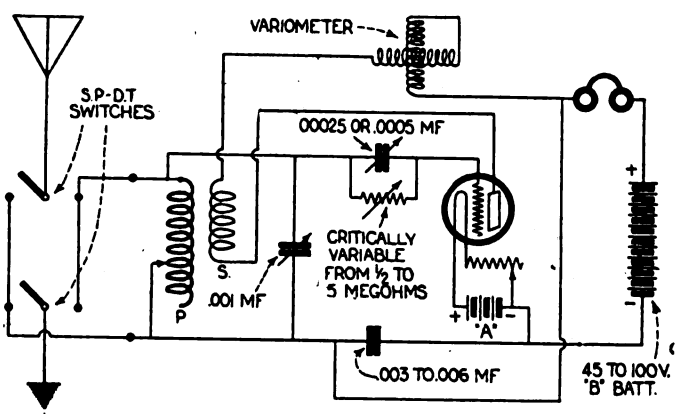

Diagram of Western's simplified Flewelling circuit.

After this set is connected as shown, light the filament and place the grid leak at a value of approximately 1½ megohms. By adjusting it will be found that a shrill note will be heard in the phones. This note can be changed by varying the tickler and grid leak. These should be continuously varied until the note is as high as possible and then a station should be tuned in by means of the variable condenser. The high shrill note will not be objectionable once the operator gets used to it. If a signal is once heard, all the adjustments should be varied until best results are obtained, paying particular attention to the adjustment of the variable grid leak.

For a one tube set, the outfit described above will give extraordinary results and will furnish opportunity for a considerable amount of interesting experimentation.

Now Is the Time

ARE you thinking over the wonderful results that your friend got on that new receiver he built last spring, and with which he corralled all the distance all summer? Well, now is the time to build it—just in the interim between the hot summer and the cool winter months. Go right ahead and build it and try it out now, so that when the DX weather gets here you will be right up with the rest of the bunch and not miss any just because your set "is not built yet."

If You Are Wise

IF you are wise and in the know you will build your detector and two-step amplifier unit in a separate cabinet from the tuner and well shield it. Then bring all your connection posts, such as grid, plate, filament, etc., out to binding posts on the back of the cabinet and make connection to your tuner through these. By doing this you will be able to change your set around at any time, and use different tuning systems without disturbing the cabinet containing the amplifier and detector.

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RADIO PRIMER—For the New Army of Radio Beginners

By Lynn Brooks

INDUCTANCES: In radio reception as well as transmission, some means for varying the frequency to which the receiver or transmitter will respond has to be evolved. In order to cover this from the receiving end tuners are used. The simplest tuner consists of a coil of wire wound on a suitable tube or former, the value of which is varied by means of a slider. This inserted in the antenna-ground lead of the receiver allows the receiver to respond to the different wave lengths due to varying the frequency value of the circuit. The greater the amount of wire used, the lower the frequency the receiver responds to and the higher the wave length. This is similar to a violin string. The longer the string, the deeper the tone and the longer and slower the sound waves.

The main disadvantage of a tuner made of a coil as described, is the fact that it is not selective. It will not respond to one frequency sharply, but responds to several bands as well. The next tuning device of the single inductance variety is the variometer. This depends upon the mutual inductance of two coils revolving within one another and connected together. As we vary the relation of the magnetic field we also vary the mutual inductance, due to the principle that two coils through which a current is flowing are at their highest point when the current runs in the same direction in both coils. As we vary this, instead of helping they practically "buck" each other.

The next important tuning device is the loose coupler or variocoupler. This consists of two windings so arranged that one can revolve or slide in and out of the other. In the loose coupler, the outside winding is generally considered the primary or antenna inductance and its value is varied by means of a slider or taps. The secondary or inside one is variable by means of taps or a slider, and can slide in and out of the magnetic field of the first. This arrangement allows sharp tuning, because the primary circuit does not interfere or have any connection outside of a magnetic one with the secondary. The current flows through the first or primary coil, which as before stated is varied as to inductance value by means of sliders or taps, introducing more or less wire into the circuit and therefore the circuit will respond to a higher or lower frequency. The current flowing in this circut induces a like current in the secondary circuit, which is also variable, and by means of sliding this in or out of the magnetic field, the best point of resonance can easily be gained, at which point the two circuits will be considered "tuned" and the strongest signals from a desired station will be had.

In the coupler of the later variety, the same principle is used, with the exception that the secondary coil is not variable as to the amount of inductance used, tuning being accomplished by varying the mutual magnetic inductance between the two. The secondary coil of these couplers is variable through 180° inside the first, coupling being accomplished by this means instead of sliding it in and out. In the latter type, when it is found desirable to gain variance of this secondary coil, it is shunted by a capacity which is variable, and the inductance value is raised or lowered by varying the capacity in the immediate circuit.

Fixed inductances used to form couplers of different types come as duo-lateral, honeycomb or spiderweb. The advantage of each of these is the fact that the distributed capacity between adjacent turns is low. In the first type this capacity contributes a great deal to the inability of the apparatus to tune sharply . This is due to the fact that one turn with its insulation forms a condenser with the next turn, the entire winding resembling a coil with a constant capacity across it.

THE REASON FOR INDUCTANCE: Many people when examining a receiver do not understand just why coils should be used in the circuits. Take as an example two stations sending. One will send out on a wave length of 500 meters (frequency value 599.6 kilocycles). Then the second we will suppose will send on 400 meters (frequency value 749.6 kilocycles). Now should we desire to receive the one on 500 meters, we should introduce enough inductance or inductance and capacity into our circuit to enable our receiver to respond to or approximate the frequency value of the desired station. This is seen to be 599.6 kilocycles, which means that the alterations or waves emanating from the transmitter make 599,600 complete reversals per second. When our receivers respond to this frequency we have the station tuned in and we hear the voice or signal. Now should we desire to hear the one on the lower wave length, we must arrange our receiver to respond to a higher frequency. Analogy: The shorter the string of the violin, the higher the tone, the shorter the wave vibrations, but the faster. Therefore, we remove some of the inductance from our circuit and when our circuit will respond to 749,600 cycles per second we have succeeded in tuning our receiver to 400 meters.

No Broadcasters Licensed

FOR the first time in many months no new broadcasters sought licenses for stations during the week ending September 8. This is a confirmation of predictions of Secretary Hoover, and his radio aides, that the saturation point has really been reached. That 567 were enough broadcasters, nearly everyone agreed last month, and so few regret that the number has fallen off four. The point now established is that evidently those who contemplated entering the field also recognized this fact and refrained from taking out licenses. The activity this month is the least since February, 1922, which indicates a better state of stability in the broadcasting field.

During August seven new stations came into being, thirteen transferred from Class C to Class A, and eleven ceased operation. This leaves the present number of broadcasters at 563 stations, a large percentage of which are good, reliable stations, likely to survive.

One Class B station, well-known WGY, transferred from its classification to Class D, covering broadcasting development, and now shares this honor with Pittsburgh's KDKA.

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Tests on Radio Transmission by Day and by Night

Effect of Light and Darkness on the Energy of Radio Waves

MEASUREMENTS of the energy of radio-transmission between Rocky Point, Long Island, and London, made last winter by cooperation between the Radio Corporation of America and the American Telephone and Telegraph Co., bring out some interesting facts, reported by Ralph Brown, of the telegraph company to the National Academy of Science and printed in its Transactions. The tests show that the energy of the transmitting wave is about eighteen times as great in the middle of the night as it is in the daytime. This difference, however, lessens in the summer when the nights are shorter. It appears to be due to the fact that obstacles resulting in absorption are fewer by night than by day. A typical example of the strength of the waves as they reached England is given in the diagram herewith.

When daylight covers the entire transmission path from Rocky Point to London the field is uniformly low but during the night it rises to considerably higher values. At night the field is relatively steady and free from fluctuations of the kind ordinarily known as "fading," but the general shape of the curve may change from night to night as is indicated by the dissimilarity between the two dark periods shown.

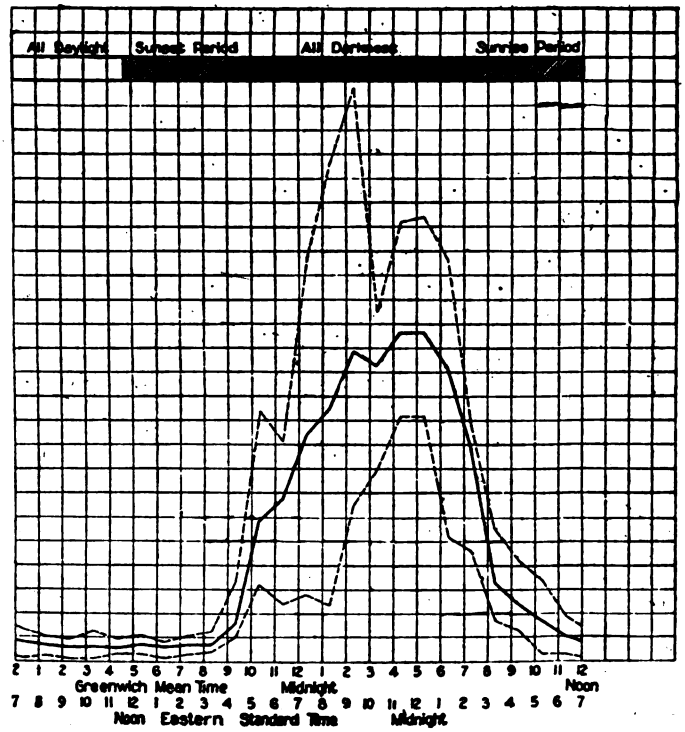
The outstanding thing shown is that the high night values are practically as steady as the day values and have no greater percentage variation from the average. The improved night transmission is a definite recurring phenomenon which may not properly be called a freak transmission effect.

In accordance with the usual theory of radio transmission the decrease in strength of the electric waves, as they pass outward to the distant receiving station, is caused by the spreading of their energy over a larger and larger circle of wave front and by losses due to the electrical imperfections of the media traversed.

One characteristic of these winter-time data is worthy of note. The average night values are eighteen times as large as the average day values and rise about halfway up the field which would be obtained if there were no absorption loss in the transmission media, yet, not even the maximum recorded field shows any tendency to exceed the theoretical value for transmission without absorption loss. This evidence falls easily into line with the theory that good night transmission is simply due to a diminution of the absorption losses.

During the last days of February a radical change occurred in the nature of the night transmission phenomena. The reason for the suddenness of the shift is unknown, but a decrease in the night field is consistent with the fact that the period of darkess over the entire transmission path is only about 6 hours on April 1, as against 10½ hours on January 1.

Of the ten hours winter night, six hours are spent in rising to and falling from the high values, which are steadily maintained only during a four-hour period. When the time of darkness over the entire path decreases to six hours or less the peak might be expected to be wiped out.



Curves showing how the energy of the transmitting radio waves varies. The dotted lines indicate minimum and maximum energy. The heavy line is the average for 54 days.

Making Use of a Nuisance

THE owners of regenerative sets regard body capacity effect as an absolute nuisance. However, it may be used to serve a very useful purpose. By its use, it is possible to tune a station in to the exact point where reception is at its loudest. When tuning a set, using a vernier, it is hard to tell when the station is coming in at its loudest, as a small change in volume is hard to detect, although this same small change would perhaps be useful in getting the call letters of a station after it has begun to fade.

In the first place, the fixed plates of the condenser should be connected to the grid of the tube. Shielding is then unnecessary. This reduces body effect a great deal. What is left may then be used for accurate tuning. Proceed as follows: Tune the condenser until reception is at its loudest. Then remove your hand from the dial. If the volume of the signal decreases, increase the capacity of the condenser slightly. Repeat this, until when you take your hand away, there is no decrease in volume. If when you first take your hand away, the volume increases, you can usually get it slightly louder than this by reducing the capacity of the condenser until there is no change in volume. This plan is more valuable when the station is coming in weak rather than loud, when a slight change in volume is hard to detect.

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Combining Regeneration with Tuned Radio-Frequency

By R. L. Dougherty

IN RADIO WORLD for August 11 there was described a method of combining tuned radio frequency in a set in such a manner that it could be rightly called a "Universal" receiver, inasmuch as it would receive over all wave lengths from 180 to 25,000 with equal ease.

While fair success could be had with a receiver of this sort, the present day fans are so accustomed to the use of regeneration in connection with their receivers that they scorn to tackle one that does not combine it in some form, as being beyond the pale. In a way they are right, as regeneration makes remarkable distance possible. But when combined with a receiver of the sort shown in which feedback coupling is had through the radio-frequency tube, there is a liability that the ticklishness of the receiver will cause plenty of "howls" if the receiver is not tuned just right.

The constants of the receiver remain practically the

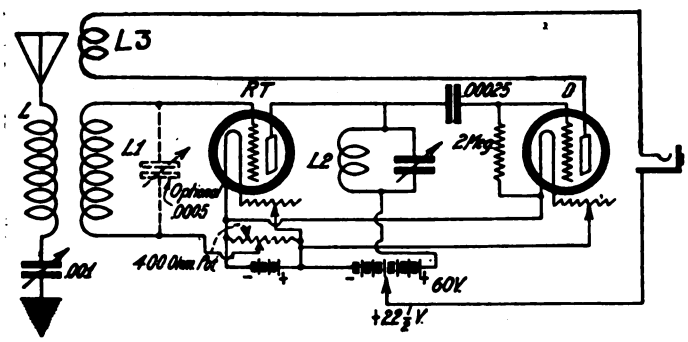

Fig. 1. Circuit diagram illustrating how you can add regeneration to the tuned radio-frequency receiver described in RADIO WORLD, August 11. By inserting the feed-back coil (L3) the advantage of regeneration is added to the circuit, combining the distance possible with radio-frequency with the sharp tuning of a regenerative circuit. Being a double circuit it is selective and flexible. The constants are identical with those of the August 11 circuit, with the addition of the feed-back coil.

same as that of the aforementioned receiver, with a triple honeycomb coil mount used for the primary, secondary and tickler. You can therefore really call this an accommodation of the three-circuit regenerative receiver with a stage of tuned radio-frequency amplification. The addition of regeneration to the receiver can easily be made if the first set has already been constructed, as all that will be necessary is the breaking of the plate lead that goes to the phone and the insertion of the third or tickler coil in the circuit.

For the edification of the fan who is sceptical as to the efficiency of the "tuned impedance" type of radio-frequency, it might be of value to state that there is no form of radio-frequency amplification as popular with the fan who wants real selectivity as that particular form. The fan who knows by experience, won't tackle anything but tuned radio-frequency, simply because of the extreme selectivity it affords. It is no exaggeration to state that a difference of four meters in wave length between two stations is sufficient to render either one of them inaudible when the other is tuned in.

By employing regeneration in this circuit, a bit of the selectivity may possibly be lost, but not so much that you will be bothered with anything like broad tuning. The detector tube cannot respond to anything but the wave that the radio-frequency circuit is tuned to, so for that reason I advocate that all fans who have enough experience in the operation of a receiver should use tuned radio-frequency, leaving the transformer coupled for those who do not mind whether they get selectivity or not. As a matter of plain fact really sharp tuning with transformer coupled radio-frequency is not only impossible—it is foolish to even expect it.

Take into consideration the fact that you must tune your primary circuit in order to receive signals. To do this you vary the inductance, or the capacity, either shunting or in series with the inductance, or both, whichever may give you the best tuning. After passing through the radio-frequency tube the impulses that originally passed through the antenna circuit are identically the same—they have not changed one bit. Why not tune your radio-frequency amplifiers the same way? When using the transformer this is impossible because the windings cannot be varied, nor will shunting capacitances across them give any real tuning or help.

Page after page could be written enumerating the advantages of tuned radio-frequency, both as to theory and practice, but as this is not meant to be an article of that type the aforementioned advantages should be sufficient to convince anybody that for real tuning selectivity, where radio-frequency is concerned, the only way of approaching the subject in the correct manner is to use some means of tuning your radio-frequency amplifiers.

When constructing the receiver it is imperative that the entire panel be shielded very carefully. Ground this shielding. Also see that the rotary plates of the condenser in the primary circuit are connected to the ground. The condenser across the tuned impedance coil should be affixed to the panel by means of extension rods so as to keep it at least two inches in back of the panel. This can be done by the use of a sub-panel back of the main panel, and using a fiber rod to manipulate it. This is illustrated in Fig. 2. If the optional condenser is used across the secondary, it also should be mounted on a sub-panel 2 inches in back of the main panel, using an extension rod for manipulation. This is because both regeneration and radio-frequency is used. If these two condensers are not mounted in the manner explained it will be almost an utter impossibility to hold a station if the hands are taken away from the controls once it is tuned in—due to the metallic shafting.

Wire the set very carefully according to the diagram, using the varnished cambric tubing or "spaghetti" wherever leads cross at close quarters, and making the leads on the tuned impedance circuit as short as it is humanly possible for you to do it. An easy manner of accomplishing this is to mount the honeycomb mount for the coil L2 on the same sub-base directly under the condenser. Then by using binding posts on the back of the base, the battery and tube connections can be made as short as possible, and you will not have to run your leads all over the panel.

When tuning the receiver it will be found necessary to change the tuning of the circuit L2 by means of the condenser for every change in tuning in the primary

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circuit unless the station is on the same wave length. After handling the receiver a week or so, and becoming used to its "rinktums," you can chart the wave length that the tuned impedance circuit responds to for definite settings of the condenser shunting it and for definite inductances used.

In operating the set turn on the two tubes to normal brilliancy and, selecting an arbitrary value for your L2 circuit, manipulate the primary, secondary and tickler much the same as you would were you using the regulation three-circuit honeycomb circuit. When a station is heard leave the primary circuit as it is and manipulate the circuit L2. Generally the signals will respond with a suddenness that is surprising, and if the condenser is not turned carefully you will run right over it, so for that reason it is a good idea to incorporate a panel vernier button for use with the circuit. Then, after hearing the call and desiring a station of lower or higher wave length, either more or less capacity is used in that particular circuit. Retune your primary, secondary and tickler controls until the station is heard. Then, after tuning your L2 circuit, increase the coupling of your secondary and tickler until the station comes in thickly—then clear it up with the potentiometer, lastly retuning your L2 circuit for maximum signals.

The circuit shown is easy to work once you get the hang of it, but there is a great deal of fine tuning that will have to be done before the signals will be tuned in correctly, so for that reason do not get impatient if you do not succeed in tuning in KYW the first night that you work it, even though the local stations may be comparatively easy to tune in and through. Learn how to do it exactly on the local or nearby DX stations before trying the real DX and you will become so used to manipulating the controls that you will instinctively tune the set simply by the "feel" of the air.

The circuit is especially adapted to the new UV199 tube because no storage battery is necessary, and also because these tubes are such marvelous radio-frequency amplifiers. You will be surprised at the volume possible with this circuit on cool winter nights as well as the distance that you can cover with it.

For broadcast work the coils for circuit L2 should be 35, 50, and 75. These will allow the receiver to cover all the broadcast waves efficiently. For the lower stations use the smaller coil, for the medium station use the larger coil, and for stations operating around 600 use the largest. If amateur stations are desired it is good to incorporate a 25 in the outfit also. It will take but a few minutes to find out which coil should be used in the L2 circuit for each band of wave lengths. For the primary, secondary and tickler circuits the regular honeycomb coils that are generally specified for a given wave-length should be used. However, for the information of those planning to build this receiver to respond to broadcast waves, it is safe to recommend that they purchase two each of the coils stated above and by changing them around in various positions in the mounting they can strike the happy medium. It is always best practice to use a smaller value of secondary inductance than that used as a tickler.

Care in construction, carefully soldered leads, and good panel material carefully shielded will repay the builder by surprising distance and tuning when the DX months come along. Then if it is considered necessary an additional two-stage amplifier can be added and loud-speaker operation is in order for all stations that can be heard on the detector.

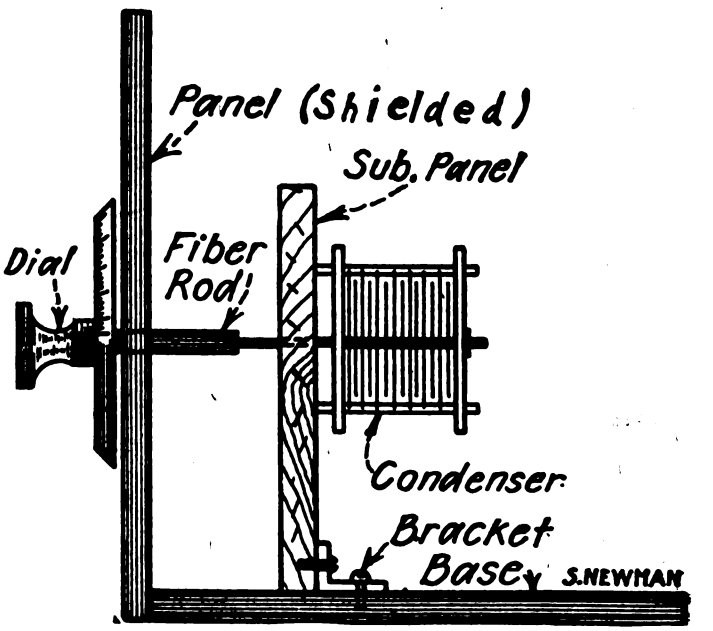

Fig. 2. Showing how to arrange the condensers on a sub-panel in back of the main panel to reduce any possible chance of capacity effect being felt. The sub-panel may be of well-dried hardwood, or small panels of hard rubber or bakelite. A space of two inches should be allowed between the panel itself and the sub-panel.

Retrieving Fading Stations

By Byrt C. Caldwell

WHEN the DX stations begin to swing and gradually fade away, most fans frantically begin to twirl the dials in the foolish belief that they can in this way regain the station. After a few minutes, they succeed in again tuning in the station, but the announcer has given the call letters, and more music is being played. Then it fades again and the process of losing the station is repeated. The fan usually succeeds in not succeeding in getting the precious call letters. Although, by leaving the tuning strictly alone, the signals will usually swing back again, it is often possible to coax them back. It is, of course, impossible to make them swing back. However, the fan seldom has his set tuned for maximum sensitivity.

When the signal fades, if it does not disappear to the extent that it is impossible to hear speech, leave the set alone, but if it fades until it is no longer audible, or is merely a whisper in the phones, tighten the coupling of the set until it just begins to howl. Then very carefully, with the accent on the very, loosen the coupling. This will often bring the station in again, and when the signals swing in they will be louder than they were in the first place. In this condition, the set is wonderfully sensitive, so sensitive in fact, that it is liable any moment to "spill over." In this case loosen the coupling until the set stops howling.

This plan is only adaptable to those sets which use a tickler feedback, or which have some means of controlling the regeneration. (See RADIO WORLD, September 1, page 15).

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Characteristic Curves of Vacuum Tubes and Their Meaning

By J. E. Anderson, M. A.

ALTHOUGH articles on the characteristics of vacuum tubes appear from time to time in various radio journals, there still seems to be a demand for more, at least if the number of questions that are asked daily by radio fans is to be taken as a criterion. The questions that are most frequently asked concern the various means for maintaining the grid at the proper potential with respect to the filament, such as the grid biasing battery, the grid and plate potentiometers, the grid leak and the filament vernier rheostat. In view of these questions it will not be amiss to call attention to the characteristic curves and some of the information they contain.

The most important of the characteristics of a vacuum tube is the relation between the grid potential with respect to the filament and the plate current. A study of this relation will answer all the questions referred to above. In order to have a visual representation of this relation it is usually plotted on a sheet of cross section paper, using the plate current expressed in milliamperes as ordinates and the grid potential expressed in volts as abscissæ. Fig. 1 shows a set of the resulting curves, taken for four different plate potentials and covering a range of grid potentials of 60 volts, 30 volts on each side of zero or the filament potential. These curves will be better understood after an explanation of how they are obtained.

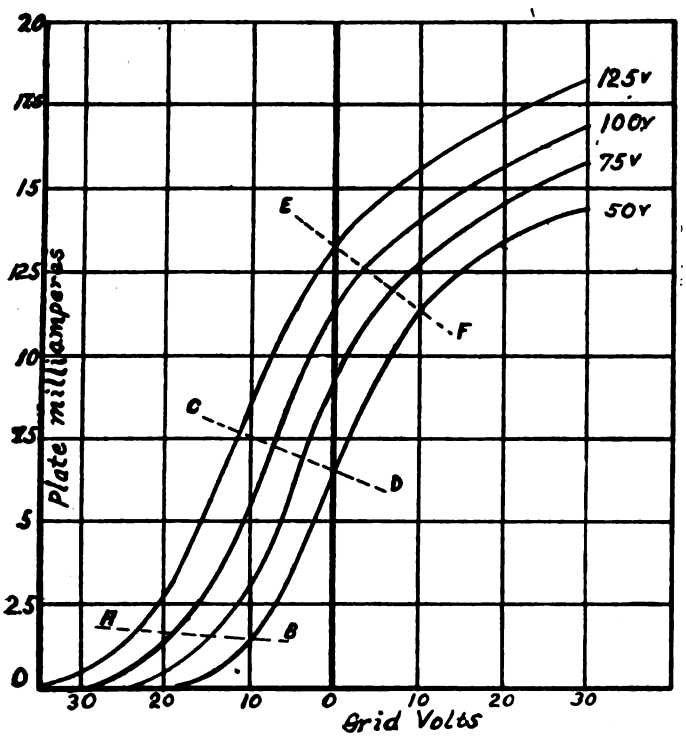

Fig. 1. Typical graph plotted for a vacuum tube at differing plate potentials, showing the relation of the plate current to the grid potentials. Charts such as these are the result of the experiments outlined in the accompanying article.

Fig. 2 shows the circuit used to obtain the curves of Fig. 1. It is typical of many vacuum tube circuits that are in daily use in radio receivers. B_1 is the grid battery which determines the grid potential, and B_2 the plate battery which determines the plate potential, both being measured with respect to the filament. V_1 and V_2 are voltmeters with which the respective voltages of B_1 and B_2 are measured. A is an ammeter with which the filament heating current is measured, and M is a milliammeter with which the plate current is measured. The data desired are the readings of the milliammeter and the corresponding readings of the grid voltmeter, while the filament current and the plate potential are kept constant at some desired values. The procedure is as follows:

The voltage of the plate battery B_2 is first adjusted to some desired value, say 50 volts. Then the filament is lighted and the heating current adjusted to the proper value. With the aid of the instruments A and V_2 these adjustments are carefully maintained during the run. Now the voltage of B_1 is increased, with the negative terminal toward the grid, until no current flows through the milliammeter. Then the voltage is gradually reduced, in steps of about three volts, and the corresponding reading on the milliammeter observed for each value of the grid potential. When the voltage in B_1 has been reduced to zero, the grid battery is reversed, so that the positive terminal is toward the grid, and then it is gradually increased until the entire battery is in the circuit, while readings are taken of the plate current for each value of the positive grid potential. When this run has been completed, the data are plotted on cross section paper, and the lowest curve in Fig. 1 is obtained. Now the voltage in the plate battery is increased to some other convenient value, say 75 volts, and the process is repeated for the new plate potential. Thus the second curve in Fig. 1 is obtained. The other curves are obtained similarly.

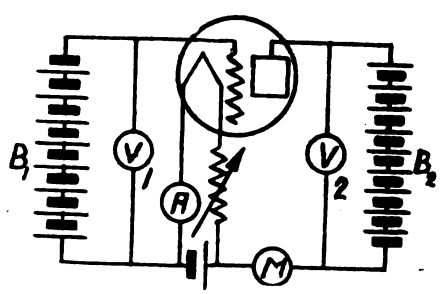

Fig. 2. Diagrammatic circuit of the apparatus used to plot the curves shown in Fig. 1. The apparatus and its manipulation to obtain the characteristic curves is described herewith, giving the reasons for each adjustment.

By studying the curves in Fig. 1 it is seen that the effect of increasing the plate potential is to shift the curves as a whole upward and toward the left in such a way that they remain almost parallel to their original position. This variation is quite regular so that it is possible to estimate accurately the position of curves corresponding to intermediate values of plate potential, and it is even possible to visualize the position of curves corresponding to higher and lower plate potentials than those given. For any given value of grid potential the plate current is greater, the greater the plate potential is.

The characteristic curves do not depend solely on the tube, but also on the circuit with which it is associated. Curves obtained with one particular circuit will be different from those obtained with any other. The

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difference is usually slight, but it is important to know the effect of various changes in the connections. In Figs. A to G is shown a set of circuits which are in daily use. Another set of circuits may be obtained by putting the filament rheostat in the negative lead to the filament. All of these circuits would give slightly different curves. These curves would not differ greatly in shape, as that depends mainly on the structure of the tube and on the filament temperature, but their position with respect to the reference framework would be different; that is, they would be shifted with respect to the line of zero grid potential.

Fig. A is the same circuit as Fig. 2. Hence curves obtained with it will be the same as the curves in Fig. 1. Fig. B differs from Fig. A only in that the plate return lead, or the negative terminal of the plate battery, is connected to the negative side of the filament battery. This is equivalent to a decrease in the plate potential by an amount equal to the voltage of the filament battery. The curves will then be shifted downward and to the right by a small amount. In both of these circuits the grid return lead is connected to the negative side of the filament battery. Hence the grid will be negative with respect to every part of the filament. This is a desirable condition in amplifier circuits, and consequently these two are used for that purpose.

Figs. C and D differ from each other in the same way that A and B differ; that is, the effective plate potential of C is greater than that of D by an amount equal to the voltage of the filament battery. The two differ from the preceding circuits in that the grid return lead is connected to the positive side of the filament battery. This renders the grid positive with respect to every part of the filament. This condition is desirable in detector circuits when detecting with grid condenser and grid leak. Hence, Figs. C and D are used for that purpose.

The effect in Figs. A and B of putting the filament rheostat in the negative lead to the filament is to make the grid more negative with respect to the filament; that is, it is equivalent to inserting a small negative grid biasing battery in the grid circuit. The amount of this bias depends on the resistance in the rheostat and the current flowing through it. It may vary from a small fraction of a volt to one or two volts. This connection is desirable in amplifier circuits for certain values of plate potential. The effect in Figs. C and D of putting the rheostat in the negative lead is to make the grid more positive with respect to the filament. This may make the grid too much positive for best detection and therefore it is usually not desirable.

Fig. E is a type of circuit that is used quite extensively in detectors and amplifiers. It is like Fig. A in its plate connection, but unlike it in that the grid return lead is connected to the sliding contact of a high resistance potentiometer which is connected across the filament battery. This makes it possible to adjust the grid potential to have any value between the two extremes of the filament battery. This is useful in both amplifier and detector circuits as it furnishes a fine adjustment of the grid potential. This is essential in "soft" detector tubes if they are to work at their maximum detecting efficiency. Fig. F differs from Fig. E in the connection of the plate return lead. These two circuits become identical if the plate return lead is connected to the sliding contact of the potentiometer.

Fig. G shows a circuit which is so arranged that the grid may be kept at a potential half way between the two terminals of the filament, as in Figs. E and F, and in which the filament is heated with alternating current. If the grid return is connected to the middle point of the high resistance potentiometer one half of the filament is at a higher potential than the grid and the other half is at a lower. This holds for both direct and alternating current, and it holds for all instantaneous values of the alternating current. Hence the average value of the filament potential with respect to the grid is zero at all times during the alternating current cycle. This balances out the generator hum which would otherwise be present in the output of the tube. This effect is not upset when a biasing battery is inserted in the grid circuit.

All the circuits shown above are different, but their differences may be reduced to two types; namely, a difference in the effective plate potential and a difference in the normal grid potential. The effect of a change in either of these may be seen from the curves in Fig. 1. The first produces a shift of the curves so that they remain parallel to their original position, while the second merely shifts them along the axis of grid voltage.

How do the curves show what negative grid biasing battery is needed to produce best a certain desired result, say greatest amplifying efficiency or greatest detection efficiency? Referring to the lowest curve in the figure, assume first that there is no grid biasing battery in the circuit and that an alternating voltage of amplitude 10 volts is impressed on the grid circuit. Then the grid voltage will fluctuate between minus 10 and plus 10 volts. When the voltage is plus 10 the plate current is 11.25 milliamperes and when the voltage is minus 10 the plate current is 1.25 milliamperes. Hence the impressed voltage of double amplitude 20 produces a fluctuation in the plate current of double amplitude of 10 milliamperes. Now insert a 10-volt negative grid bias in the circuit. The grid voltage will now fluctuate between zero and minus 20 volts. When the grid voltage is zero the plate current is 6 milliamperes and when the grid voltage is minus 20 the plate current is zero. Hence the fluctuation in the plate current now has a double amplitude of 6 milliamperes. Now insert a grid bias of 20 volts. The grid voltage will now fluctuate between minus 10 and minus 30. When the grid is at minus 10 the plate current is 1.25 milliamperes, and when it is minus 30 the plate current is zero. In fact, there is no current at all when the grid voltage is less than minus 20 volts. That means that there will be uni-directional pulses of current corresponding to the positive half of the input wave. In other words, the tube acts as a rectifier of electric oscillations. But the greatest rectification or detecting efficiency does not

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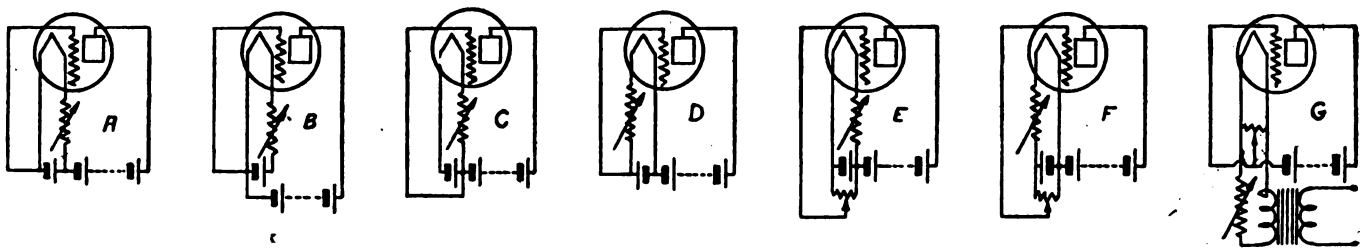

Figs. A, B, C, D, E, F, G. Schematic diagrams of vacuum tube circuits as used in experimental work to determine which method of obtaining the grid bias functions best with various tubes for various types of circuits.

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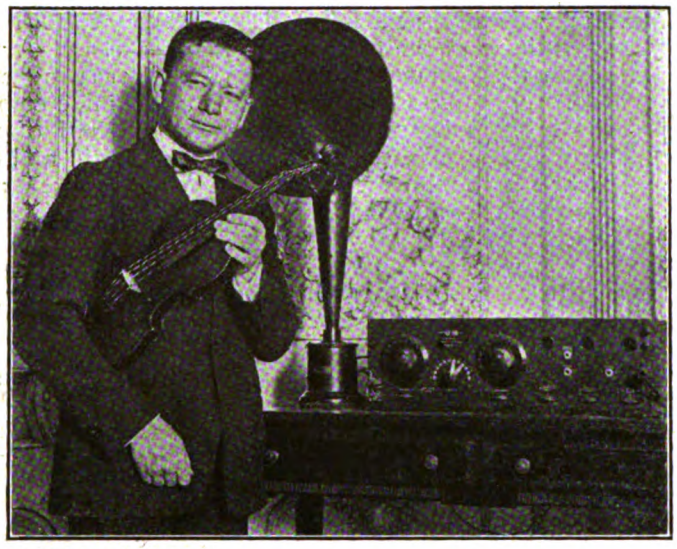
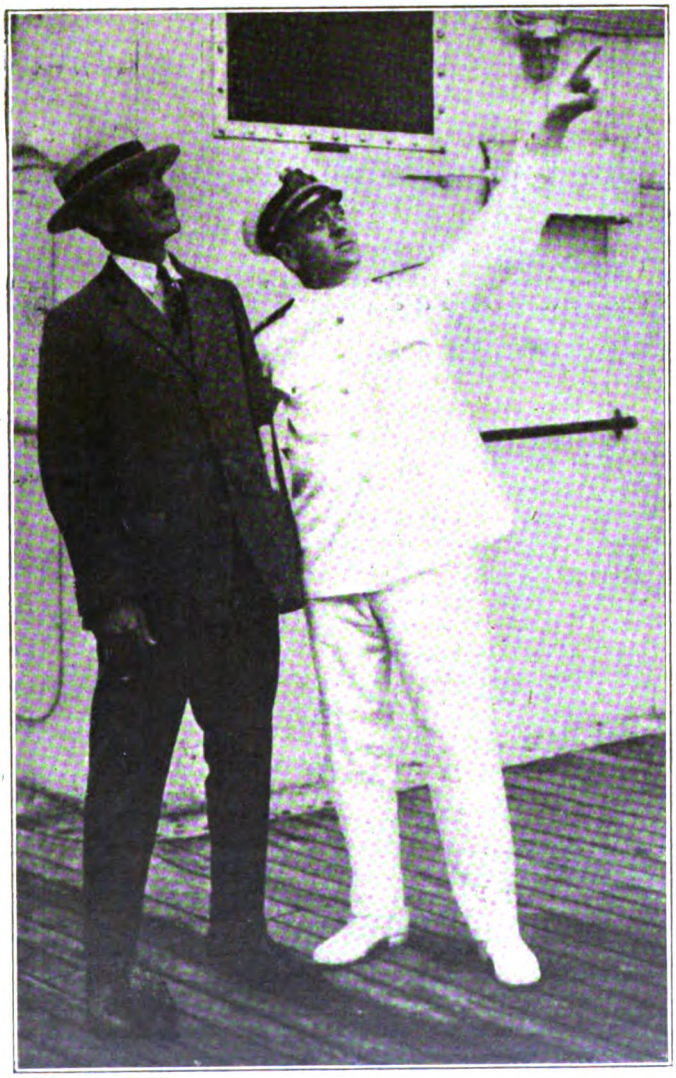
If There Isn't Variety In These Ra



(C. Kadel and Herbert)

Efrem Zimbalist, famous violinist, with his new $33,000 "Titian" Stradivarius which he recently brought to America, listening in to a violin solo over the radio by a pupil of one of the European teachers, and comparing the original tones with that coming over the radio. Needless to say, Zimbalist is a radio enthusiast.

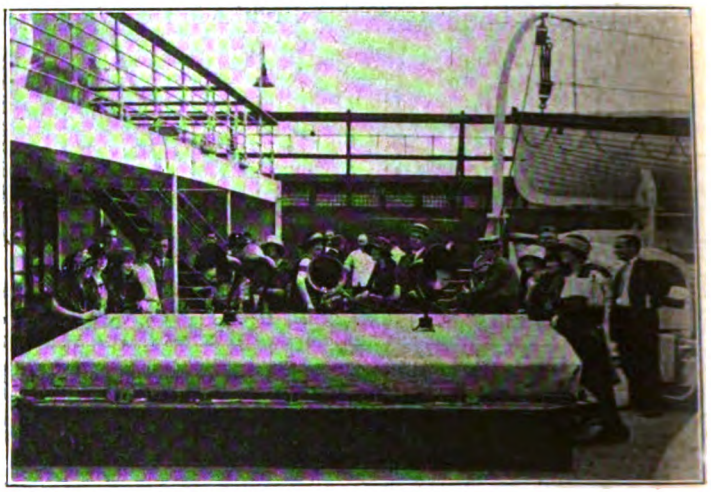


(C. Photonews)

E. N. Pickerill, chief radio officer of the giant of the seas, the "Leviathan," and the noted radio engineer and inventor, Dr. Lee DeForest. Pickerill is pointing out to the inventor the dual antenna system, and explaining how it is used in daily traffic on board the ship. Dr. DeForest sailed on the "Leviathan" to complete some new foreign radio inventions.

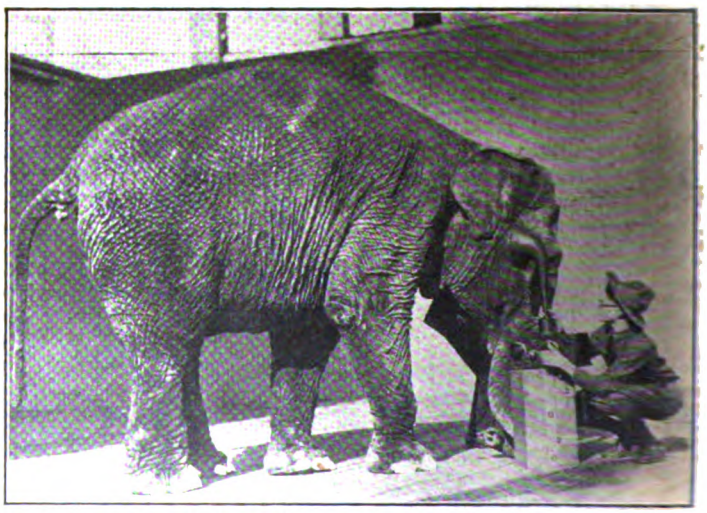
(C. Fotograms)

No matter where you motor, if you have a portable loop and a portable set, you can always set it up and have music while the rest of the folks are arranging the eatables. Miss Sophie Plass is shown listening in to some good jazz music out in the "great outdoors."



(C. Underwood and Underwood)

Passengers on the S. S. "California," the new Anchor liner, enjoying a real radio concert furnished by the operators of the ship. From the expressions on their faces, some comedian must have "cracked" one for their benefit.



(C. Underwood and Underwood)

Pachydermatous pleasure is the outstanding expression of the immense elephantine radio "phan" upon hearing a talk upon the serious situation that the anthracite coal operators are causing in the homes of the United States. He did not appreciate the jazz, because he wanted to dance and couldn't find a suitable partner.

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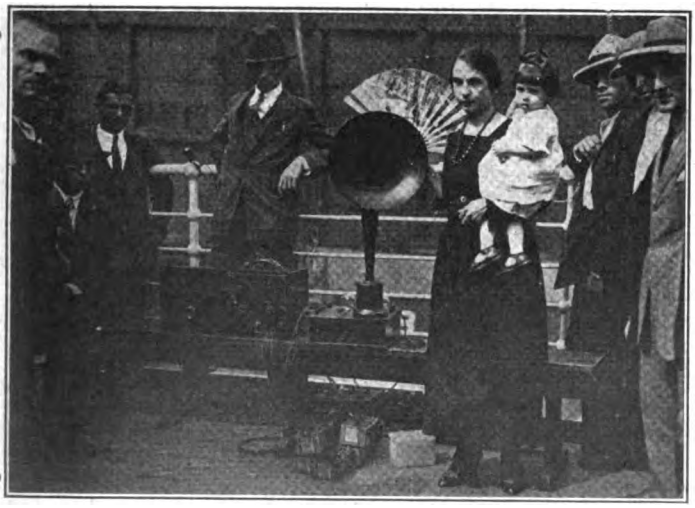
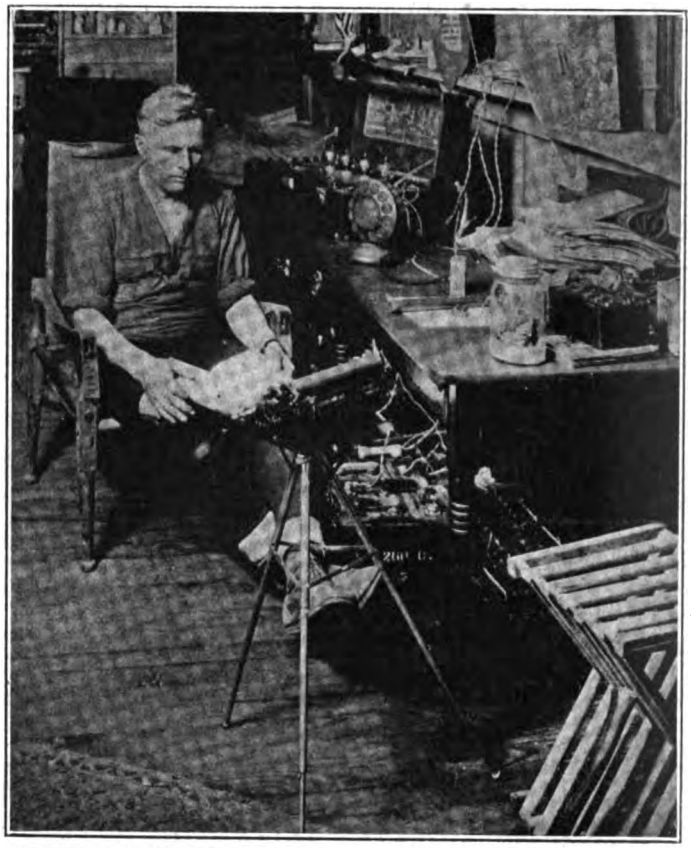
dio News Pictures—But There Is!

(C. Kadel and Herbert)
The very latest radio novelty is a complete radio set on a lead pencil. The inductance is wound around the pencil, contact being made by means of the clip. The crystal detector is located in the place normally supplied with an eraser. Two binding posts complete the scheme of things, which when connected with antenna and ground and a pair of head phones and Miss Annette Bade, brought in the locals very nicely.

(C. Kadel and Herbert)
Bud White and his trained bear John Brown enjoy some radio concerts, and as a mark of appreciation, John gives his master a very "bearish" kiss. He appreciates jazz or orchestral music, but growls at singing and speeches. How human!

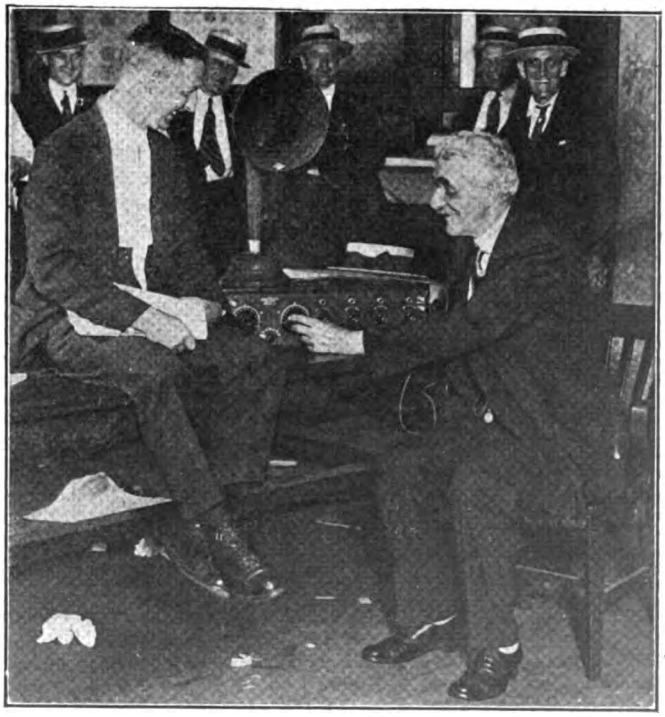


(C. Radio Corporation of America)
The radio installation aboard the S. S. "Tuscania," Cunard liner, was used on Labor Day to entertain the Italian immigrants when the vessel was detained at her pier in New York City owing to congestion at Ellis Island. Most of the immigrants had never even heard of radio broadcasting before, much less heard it, and they were struck silent with awe.



(C. Gilliams Service)
Camp Director "Uncle" Frank F. Gray reading to the Boy Scouts of Camp Glen Gray through the public address system installed there. All the talks, music and re-amplified broadcast programs are sent over this public address system at the camp and can be heard at any point within its domains.

Captions by Robert L. Dougherty



(C. P. and A. Photos)
A. Schultis (right), who is retiring from the New York Central Railroad after 33 years of service, was presented with a complete Crosley receiver and loud speaker by F. Ferguson (left) on behalf of the trainmen and conductors of the Harlem Electric Division of the New York Central. Schultis is tuning in and letting the boys in on his new gift.

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RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Ampere is said to have been an acknowledged scientist and great mathematician at the age of thirteen.

* * *

"That's a pretty good joke," exclaimed the radio operator after somebody had sprung a hot one. Then, reaching for his instrument, he added thoughtfully: "I'll tell the world."—American Legion Weekly.

* * *

For the past two years applications for patents and trade marks have averaged 9,000 per month in the United States Patent Office. Despite the increased flow of new ideas, real and alleged, the clerical work of the bureau has kept entirely up with it.

* * *

More than 1,350,000 electric lamps were purchased for the use of the various federal government departments during the fiscal year ending June 30, 1923, at a total cost of $353,000. The average cost to the government was 26 cents for each lamp, as compared to an average cost of 30.3 cents for lamps bought in 1922.

* * *

Mrs. Hertha Ayrton, a well known electrical scientist and the only woman member of the British Institution of Electrical Engineers, died last week at her home in Lancing, Sussex. In 1885 she was married to Professor W. E. Ayrton, her maiden name being Marks. She invented and constructed a line divider and assisted in the completion of a series of experiments on the electrical arc for Professor Ayrton during his absence in America in 1893.

* * *

Tungsten wire as fine as cobweb, measuring only one-thousandth of an inch in thickness, is now wound into minute coils for electric light filaments by a machine that stretches, heats and winds the cobweb-wire at a rate of 4,000 turns a minute. A core of metal, itself but four one-thousandths of an inch thick, travels through the machine, and the tungsten wire, heated cherry red by an electric current, is wound around this. When the tungsten coil has been formed, the core, of steel or brass, is dissolved out with acid, and the tiny filament is ready for service in an electric lamp.

Lightning doesn't strike twice in the same spot; it doesn't have to.—Colorado Springs Farm News.

* * *

It would be interesting to know how long Magnus Johnson's wave length is, not that we care to listen in, but merely as a matter of scientific information.—Ohio State Journal.

* * *

An ornithologist states that birds have accents according to the part of the country they are found in. The remarks of a Billingsgate parrot, which recently got tangled in a wireless aerial, seem to bear this out.—London Opinion.

* * *

More than 33,700 men and women now are employed in the shops and offices of the Hawthorne works of the Western Electric Company. This is approximately 5 per cent. of the total working force of Chicago. The Hawthorne works has now reached a point where it is practically twice as big as any other manufacturing organization in Illinois. During the last five years the number of workers has more than doubled.

* * *

The U. S. S. "Omaha," recently commissioned scout cruiser, attained maximum speed of 35.36 knots on her official trials. The average for six knots was 34.92. The "Omaha" is one of three vessels of this type built by the Todd Shipyards Corporation and equipped by Westinghouse Electric & Mfg. Co. She develops 100,000 horsepower—as much as the "Majestic" which is nine times larger—and is the speediest craft in the world of over 1,300 tons displacement.

* * *

Brudenell P. Boyle, assistant manager London office of the Westinghouse Electric International Co., who is on a business trip to this country, predicts a general but slow improvement in European business conditions. He believes the general increase in confidence is reflected in the building boom in England. The building industry is the only one that is showing real signs of activity, with the steel and electrical industries following. Mr. Boyle believes there can be no real stability in Europe until the Ruhr matter is settled, and he sees no immediate prospect of a settlement.

(*Concluded from page* 15)

occur at the point where the plate current becomes zero, but at the point of greatest curvature of the characteristic. This is represented by the intersections of the line AB with the curves, which for the curve in question is at minus 10 volts. Hence this is the negative grid bias required when the tube is operated as a detector-rectifier or a modulator.

If the tube is to be operated as amplifier and greatest possible amplification is desired, it must be operated at the point of the curve where the slope is steepest, because here a given variation in the grid potential will produce the greatest fluctuation in the plate current. This point is approximately shown by the intersection of the line CD with the curves. This is the point of inflection, where the curve changes its curvature from rising to falling, and is therefore the steepest possible part. For the lowest curve this point coincides with the line of zero grid potential, and therefore no grid bias is needed. For the next curve the required bias is about 4 volts, for the next about 8, and for the highest curve about 11 volts. Above the line EF the tube is of little use as an amplifier.

If the object of the tube is to secure amplification without distortion, it must be operated over a portion of the curve which is as straight as possible. Distortion is due to the curvature. Fortunately the curve is straightest where the amplification efficiency is greatest, that is, at the point of inflection, given by the intersection of the line CD. The curve is nearly a straight line in the immediate vicinity of this point If the input voltage is small, say less than a volt, there will be very little distortion, but if it is of the order of 10 volts the distortion will be serious. The peaks of the plate current fluctuations will be flattened. This will introduce harmonics and the quality of the audio output will be bad. The tube is overloaded. To improve the quality in this case the plate potential may be increased, or the filament temperature may be raised. If this is not sufficient it will be necessary to use a power tube. In radio frequency amplification, distortion is not of much importance and therefore the tube may be operated at a point where the amplification efficiency is far below maximum. This is usually done to prevent oscillations. If the tube is working duplex, however, this is not allowable, as distortion would be introduced into the audio component. But high frequency oscillations may then be prevented by inserting a resistance of suitable value into the circuit being used.

It is not supposed that all experimenters and users of vacuum tubes have access to characteristic curves of their tubes, nor is it expected that they purchase the necessary meters with which to obtain their own curves. But this does not detract from the qualitative value of these curves. If the experimenter fixes firmly in his mind the general shape of some typical curves, together with the effect upon these curves of making various changes in the connections, the grid and plate potentials, and the filament temperature, he may more quickly reach the desired results experimentally by acting in accordance with his mental picture of the curves. The various changes that he makes need not be hit-or miss, but will have a definite purpose behind them.

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"B" Battery Control and Improvement

By C. White, Consulting Engineer

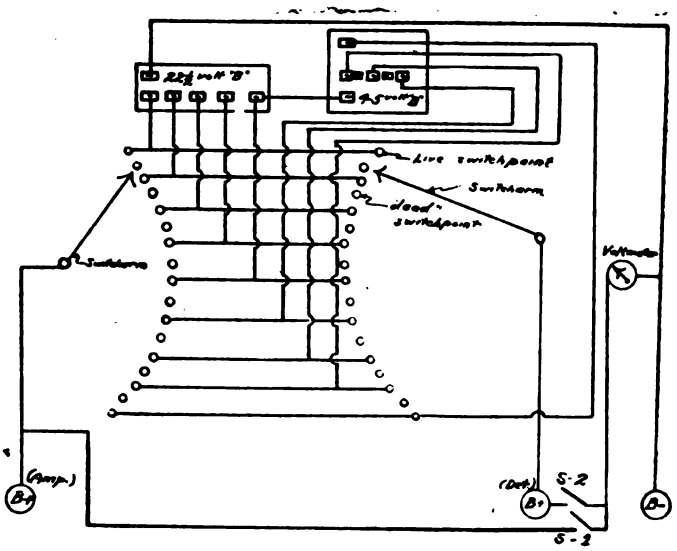
TO many amateurs the taps on the "B" battery have little or no practical use. They are often set at a given point and there the wire stays attached until something goes wrong. Generally a decrease in volume leads to an investigation of the "B" batteries. Then there is the amateur who has burnt out one or more tubes while adjusting the taps on his "B" battery and now he has the motto "hands off" as long as things move in some manner. It must be admitted that with the average set the "B" batteries are placed in a rather inconvenient place and the mass of wires behind the set leads to confusion that might result in tube casualties. The ideal arrangement for this very necessary control is the type of "B" box as outlined in this article. This box not only affords a rapid and safe method of shifting plate voltage on the detector and the amplifier but also a very quick and reliable test of the batteries. It will be well worth the time and the money to construct this outfit.

I have shown in the illustration the "B" box hooked-up to two blocks of batteries, one a 22½ and the other a 45, but you are not in the least confined to this arrangement of voltage taps; in fact, you can arrange the actual connections to the "B" batteries as best suits your particular set. If you so desire you can get a cabinet that is big enough to hold the "B" batteries or you can place the batteries outside the box. The number of taps is, of course, optional, but it is recommended that a "dead" switchpoint be placed between each two "live" ones. This is done to prevent the possibility of short-circuiting a particular cell of the "B" battery by resting the switch arm between two live contacts instead of on one only. This is impossible to do when a dead point is interposed even when shifting the switch arm. The two switches marked S-1 and S-2 are push buttons of the door bell type. It is easy to purchase these buttons in the countersunk pearl style which makes a very neat appearance for a panel-mounting. A voltmeter is one of the required articles for the "B" box. If you have not one in your possession at present I would advise you to invest in one as soon as you can. A good radio fan must be able to check up his "B" as well as his "A" battery conditions at all times.

A depleted plate battery will not only cause a diminution in volume but also introduces a certain grade of home-made static. A reliable voltmeter is the only method to tell whether your batteries in the plate circuit are still functioning properly. It is generally conceded by the dry cell "B" battery manufacturers that that type of battery is of little use when the voltage on the 22½ volt size falls below 17, and serious noise is often introduced when the 45 volt size goes below 34. This rule is by no means exact for I have personally used on amplifiers 22½ volt batteries that measured about 10 volts and got quiet operation, but this is too exceptional to be called a general occurrence, although many amateurs are getting remarkably long service from their plate batteries.

For testing a dry cell "A" battery an ammeter reading at least 35 amperes will be required. A new "A" battery will read anywhere from 27 to 35 amperes on short circuit by the ammeter. Of course, such a test should be made rather hastily, but if your battery only goes up to 10 or 12 amperes on the initial jump and falls very rapidly the cell is beginning to reach the discarding stage. A storage "A" battery should never be tested with an ammeter or voltmeter; the former would most likely be burnt out and the latter would indicate nothing of value as to the amount of charge in the battery. The hydrometer is the most simple and reliable way to test a storage "A."

Now as to the problem of bringing out the leads in the proper order so as to make the operation of connecting them to the "B" batteries as simple and safe as possible. One method is to tag each wire separately, but as you can easily see this would mean a lot of tags hanging around to be lost or torn off, and besides it would not make a neat job. The best method of bringing out the leads that are to be connected on to the



Arrangement for the amateur who is fussy about the way in which his set functions and likes to have his plate batteries arranged so that different plate potentials may be used. Also an arrangement whereby the condition of each cell, or group of cells, may be tested by means of the voltmeter to determine their condition.

battery taps is by the use of the so-called coded wire. Coded wire is wire that is covered with insulation that is so colored and striped as to be readily identified; in other words the 18 volt tap wire could be black with a solid red stripe, while the 19½ volt tap connection could be black with a dotted yellow stripe. There are many combinations of colors and stripes, so you will experience little difficulty in getting any desired number of groups. The end negative wire should have one solid color, generally coded blue or black, while the last positive tap should be red. It is obvious with such a coding system made up and listed you can easily change your "B" batteries without going all over the wires each time. This coded wire can be purchased from any electrical store or telephone supply house; if not procurable at the former you will be sure of getting it at the latter since it is extensively employed in telephone wiring.

The "B" box will not fail to give your tubes the proper amount of plate voltage and will afford an instant check on the condition of the batteries. By closing S-1 you can ascertain the exact voltage on the plates of the amplifiers and by closing S-2 the same can be found out for the detector. Never close S-1 and S-2 at the same time because this action would short circuit part of the battery. While the "B" box has been used on some deluxe cabinet and console models, it has not been generally used by amateur builders.

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Answers to Readers of Radio World

Have constructed the circuit described by A. S. Gordon in RADIO WORLD, *April* 14, *page* 4. *How can I add additional amplification to this circuit?—Roy Maguire,* 899 *Neptune Ave., Coney Island, N. Y.*

If you will refer to the Answers to Readers column of RADIO WORLD, August 18, you will find the diagram you wish. This will enable you to add another two-stage unit to your set.

* * *

I desire to study the code and the theory of radio, to enable me to enter the radio branch of the navy. Can you advise me just what course I should pursue?—Jack Laitin, Minneapolis, Minn.

The navy trains men for this service. Put in an application with the commandant of the nearest navy yard, and he will inform you of the location of the nearest radio school of the navy.

* * *

I have the standard three-circuit regenerative receiver. I want to use this circuit with a loop antenna and not use any radio-frequency. The circuit uses detector and two stages of audio-frequency. Could I convert this into a super-regenerator? Would a super give me greater volume than the one that I have now? What wave length will the receiver respond to?—Harry Kenaga, El Reno, Okla.

You cannot operate your present set on a loop. In order to use a loop you must use radio-frequency or a super-regenerative circuit such as is herewith given. The parts are all marked. The loop you mention is O. K. for use with this circuit. The circuit will cover all the broadcasting wave lengths. You cannot use dry cell tubes with this circuit and do it justice. The best tubes for use with this circuit are the 216A or five watt tubes due to the plate voltage used.

* * *

Will you publish a diagram of a one tube super-regenerative hook-up using either an outdoor antenna or a loop?—J. Shultz, 3409 *Beniteau, Detroit, Mich.*

We refer you to page 9 of RADIO WORLD, March 17, 1923, where you will find the article you desire, written by W. S. Thompson.

* * *

Where could I obtain a circuit diagram which would enable me to add two stages of audio-frequency amplification to the circuit described in RADIO WORLD, *April* 14, *by A. Gordon? What size wire should be employed in hooking up the set? I notice that when I place my finger on the grid post of the grid condenser that the signals come in louder. Why is this?—J. Kaiser,* 2208 *Neptune Avenue, Coney Island, N. Y.*

You will find the hook-up you want in RADIO WORLD August 18, in the answers to readers department. Use No. 14 tinned bus wire, covering it with spaghetti. Change your grid condenser for one of larger size—the one you have now is too small for your tube.

* * *

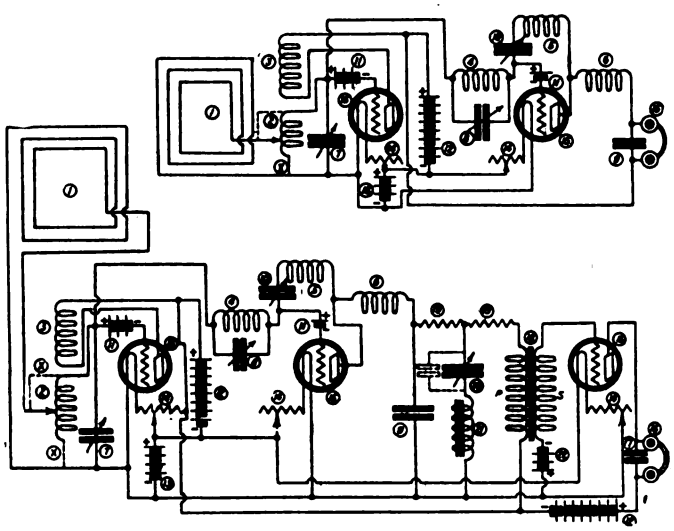
Does it matter if when using phones in a receiver, one pair is 2000 *ohms and the other is a single* 1000 *ohm receiver? I have been told that it cuts my volume down.—Jack Scheweiss, New York City.*

This should not make any appreciable difference, if the phones are of good make and in good condition.

* * *

I have had a power amplifier for nine months. It has at times a tendency to be "muffled." I have been told that the "C" battery needs replacement. Can this be the possible reason?—Philip Domidon, Brooklyn, N. Y.

It is possible that this is the cause of your trouble, although these batteries should last for more than nine months. Renew it, anyway, being careful that you reconnect the new one in the exact manner as the old one.



A diagrammatic hook-up of two and three stage super-regenerative receivers. The constants of the circuit, according to the numerals on the diagrams, are as follows: 1—Loop antenna. 2—Primary of variocoupler, (55 turns). 3—Secondary of coupler (wound with 90 turns of No. 30 wire). 4—Duolateral honeycomb 1250 or equivalent. 5—Small air choke coil of 9 millihenries inductance. (A 250 honeycomb will do.) 6—Duolateral honeycomb 1500 or equivalent. 7—.001 mfd variable condenser. 8—.0025 variable condenser. 9—.005 fixed condenser. 10—.001 variable condenser. 11—Grid battery. 12—B battery (90-120 volts). 13—A battery. 14—Rheostats. 15—Tubes (hard). 16—Telephones. 17—.0005 fixed condenser. 18—Audio frequency amplifying transformer. 19—12,000 ohm resistance filter. 20—Capacity determined by experiment should be between .002 and .005 mfd. 21—Choke coil—100 millihenries. 22—Grid bias battery (3-12 volts). The constants are the same for both circuits, and should be adhered to. Diagrams by permission of S. Newman.

*Please inform me what transformers are to be used in W. S. Thompson's reflex Grimes circuit. I have read in articles that the UV*199 *tubes do not work well with transformer coupled radio-frequency circuits. Is this so? If so, why do they sell them for that purpose?—G. O. Halvig, Lock Box* 252, *Dawson, Minn.*

We cannot recommend through this department any particular make of competitive apparatus. Buy the best you can. This applies to all apparatus bought. The best is the cheapest in the end. The tubes mentioned work with transformers if all the directions are carried out.

* * *

Can I use an insulated wire for my antenna? Is it necessary to use more than a single wire for receiving? What kind of wire should be used?—Ethelbert Huber, 2062 *Broadway, New York City.*

You may use insulated wire for antenna, as the ether waves find no diffculty in passing through the insulation. However, no advantage would be gained by the use of the wire, and the extra expense involved is not warranted. A single wire is all that is necessary for receiving. You may use copper, aluminum, copper-clad wire, phosphor bronze, or in a pinch, even iron wire will do. The important thing, is the complete insulation of the erected wire, to prevent its grounding. Aluminum is not used much now, because of its lack of tensile strength and its tendency to quickly corrode and render any joint except an aluminum soldered joint, a high resistance.

* * *

What is tuned radio-frequency amplification used for? Can I use it in a set with a loose coupler and a crystal detector? Will it help my receiver?—Joe K. Lee, Atlanta, Ga.

Tuned radio-frequency amplification is used for increasing the range of a receiver, by amplifying the minute impulses before they are rectified and therefore making signals that would be too weak to actuate the phones or amplifiers audible. In tuned (impedance) radio-frequency amplification, advantage is taken of tuning the amplifiers to the incoming wave and obtaining additional efficiency. You may use it with a crystal detector if you wish. It will help your receiver, to cover greater distances. See RADIO WORLD, July 14, for circuit diagrams and explanations.

* * *

*Can radio-frequency amplification be added to the Westinghouse Radiola, Sr., using UV*199 *tubes? Is the new Grimes inverse better than the improved Grimes reflex as outlined by Thompson? Can a tube be used as a detector in place of the crystal? Is there any advantage to be gained by using crystal detectors in reflex circuits?—N. A. Reinhard,* 548 *Arnett Blvd., Rochester, N. Y.*

Radio-frequency cannot be added to the Senior very well without rebuilding the set, which would not be worth the trouble. The set is not designed for radio-frequency, and should not be used with it. The Grimes you mention (Thompson) is the regular Grimes inverse duplex, with the addition of a stage of pure radio-frequency ahead of the reflexed tubes. It is not advisable to use a tube as a detector in this circuit. The advantage of the crystal is absolutely faithful reproduction of the signals and speech. The added volume gained by the use of a tube is so small that it really does not warrant the loss of clearness and tone by the use of the tube.

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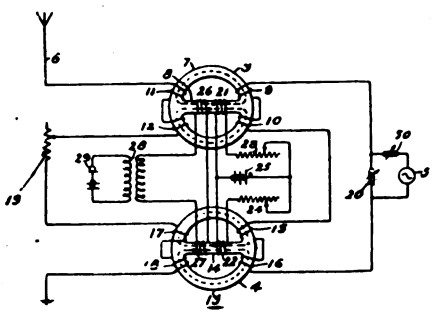
Latest Radio Patents

Modulating System

No. 1,462,838: Patented July 17, 1923. Patentee: R. V. L. Hartley, South Orange, N. J.

The invention relates to modulating systems, or systems for supplying a high frequency wave which varies in amplitude in accordance with the wave form of a signal to be transmitted.

It is well known that a wave of the high frequency *f*, modulated in accordance with the signal frequency *a*, where *a* is the instantaneous value of the signal frequency, may be considered as composed of three components having the frequencies *f*, *f*+*a* and *f*—*a*. Considerable power is wasted in radiating the unmodulated component of frequency *f*, and it is desirable for efficient transmission to radiate only the pure modulated waves of freuencies *f*+*a* and *f*—*a*, the unmodulated component being restored in any suitable manner at the receiving station.



New method of telephone modulation.

An object of the present invention is to provide a modulating system for transmitting a pure modulated wave.

The invention makes use of reactance modulators of the transformer type for controlling the high frequency output by varying the mutual inductance beween the primary and secondary winding of the transformer in accordance with a signal to be transmitted. The amplitude of the high frequency currents radiated depends upon the coupling between the primary and secondary windings and by varying this coupling, i. e., the mutual inductance, in accordance with the signal, a modulation of the carrier wave is effected. The variation in coupling is effected by varying the permeabilities of the transformer cores in accordance with the signal currents. The secondary windings of the two transformers are connected to the antenna in opposition to each other, so that no high frequency power is radiated in the absence of signaling currents. The effect of signaling currents is to increase the permeability of one transformer core, and to decrease the permeability of the other transformer core. This disturbs the balance of the opposed secondary windings, and modulated high frequency power is radiated.

The modulated wave supplied by one of the secondary windings has the three components with frequencies *f*, *f*+*a* and *f*—*a*, and the opposing modulated wave supplied by the secondary winding of the other transformer has three similar components, with the same frequencies. The two opposed unmodulated components of frequency *f* are not varied in amplitude by the signal current of frequency *a*, and these components are always balanced out so that no unmodulated power is transmitted. The pure modulated waves of frequencies *f*+*a* and *f*—*a*, developed in the transformers by the signal currents, agree in phase and so reinforce each other.

Another object of the invention is to prevent the induction of radio frequency currents in the excitation winding. This is accomplished by providing two paths in opposition for the high frequency flux, the excitation winding being linked by both fluxes so that the effect of the opposed fluxes is to induce no resultant E. M. F. in the excitation winding.

A source of steady current is used to bring the permeability of the cores to the desired point about which the permeability is changed by the signaling currents.

A further object of the invention is to use a single excitation winding for each transformer, which is to be supplied by both the steady source and the signaling source, the currents from these sources aiding in one winding and opposing in the other, and to prevent the currents supplied by each source from being short-circuited through the other source. To this end the invention provides an impedance coil circuit with the steady source and a condenser in circuit with the signaling source. The steady current cannot traverse the condenser, while the variable signaling currents cannot pass through the impedance coil, so that both currents are properly supplied to the single excitation winding.

It has been determined that best results are obtained when the modulators are energized by a generator which acts as a pure resistance. In order to provide such a generator the reactance of the same is neutralized by a reactance of opposite characteristics. For instance, if the generator has inductance, then a capacity is provided to neutralize the inductance of the generator which accordingly acts as a pure resistance.

Radiotelegraph System

No. 1,463,391: Patented July 31, 1923. Patentees: E. C. Hanson and W. C. Carlson, Washington, D. C.

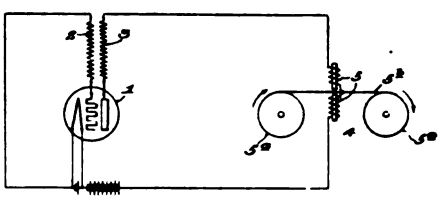
Our invention relates to the reception of wireless signals and more particularly to those systems operating on the undamped wave principle.

Heretofore, in order to actuate a signal responsive device it has been generally necessary to convert the received radio frequency energy directly into an audible frequency.

The object of our invention is to provide an arrangement for receiving undamped radio wave signals without first converting the radio frequency energy into an audible frequency.

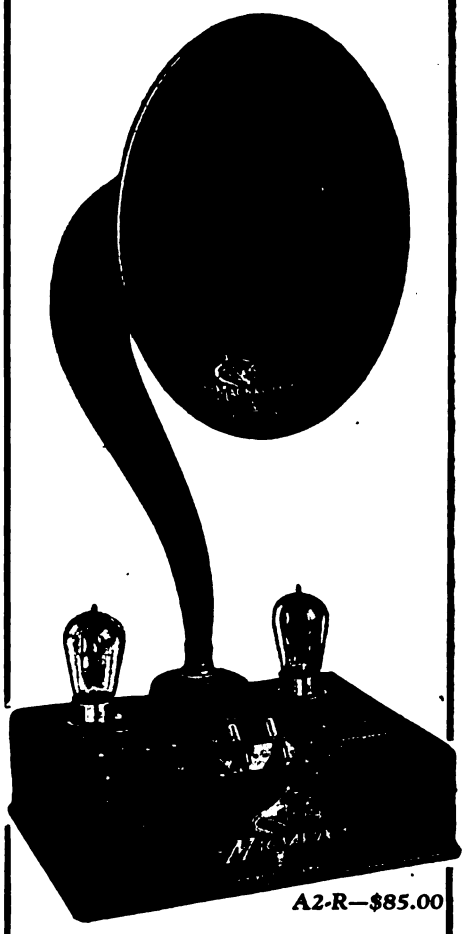
Another object of this invention is to provide an electric circuit for first recording radio signals and subsequently reproducing the recorded signals.

A further object of the present invention is to provide a circuit which will respond efficiently to sustained radio frequencies, but which will not respond efficiently to audio frequencies and strays.



Method of recording telegraphic signals.

MAGNAVOX
Radio Products



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A2-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 2 stages of amplification $85.00

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Everybody Should Boost National Radio Week

ARE you doing your share towards boosting National Radio Week which runs from November 25 to December 1, 1923?

Everybody interested in the art, science and business of radio should do everything possible to make the second annual National Radio Week bigger, better and more important in every way than the first annual event of last year.

If you have any original ideas send them to RADIO WORLD and we shall be glad to pass them on for discussion and action.

Radio Show Features to Interest Public

ONE of the interesting features provided for the second annual Radio Show, at Grand Central Palace, New York City, from October 6 to October 13, will be a series of motion pictures illustrating the practical uses of radio and the principles of operation.

Open to amateurs under 18 years of age, living within 100 miles of New York City, will be a set construction competition which doubtless will attract many.

It is expected that a radio dance will be held frequently, perhaps every night, the music being received from one of the broadcasting stations.

The principal radio reception set at the show will be in charge of the Radio Club of America, who also are the constructors of the set.

The following organizations have reserved exhibition space:

Crosley Mfg. Company, Radio Corporation of America, Western Electric Company, C. Brandes, Inc., Cutler-Hammer Co., Cutting & Washington Co., DeForest Radio Tel. & Tel. Co., Dubilier Condenser Co., Electric Storage Battery Co., Fiber Products Co., Gimbel Brothers, Gould Storage Battery Co., Grebe & Company, Inc., C. B. Kennedy & Co., Manufacturers Patent Co., Multiple Electric Products, Marko Storage Battery Co., National Carbon Co., Post Electric Co., Precision Equipment Co., Radio Digest, Radio Industries, Rocky Mountain Co., Weston Electric Instrument Co., Moon Radio Co., Neon Lamp Works, R. Mitchell & Co., Nathaniel Baldwin, Pathe Radio Co., Rasla Sales Co., Malone-Lemmon Laboratory, Eisemann Magneto Corp., Gilfillan Brothers, Willard Storage Battery, National Radio Products, Sleeper Radio Co., Horne Electric Mfg. Co., Allen D. Cardwell & Co., Sec-Tron Radio Co., Lefax, Inc., Holtzer-Cabot Company, Graham & Company, Bristol Company, Radio Dealer, J. D. Timmons & Co., New York Evening Journal, Experimenter Publishing Co., American Radio Research Corp., Acme Apparatus Company, American Radio Relay League, American Radio Journal, L. & W. Spring Co., National Airphone Co., Alden Mfg. Co., Burgess Battery Co., Pacent Electric Co., Magnavox Co., Automatic Electrical Devices Co., Federal Radio Co., Radio Publishing Co., Adams-Morgan Co., Engravers & Printers Machinery Co., Atwater-Kent Co.

Radio Sales to Farmers Should Result from Good Harvest

THAT the farmers of the United States are this year the biggest bunch of prospects in sight for the radio industry is being demonstrated almost every day. An editorial in the New York "World" is evidence of this fact. It reads in part as follows:

"The season's crops are virtually made as they appear in the Sept. 1 report on condition of the Department of Agriculture. Spring wheat suffered some little decline in estimated yield from a month ago, but the total wheat harvest is within 29,000,000 bushels of the 818,000,000 bushels produced last year. Corn will be a larger crop than then. So of oats, barley and tobacco. White potatoes at 390,000,000 bushels are a good average if 48,000,000 bushels below last year's yield. It is a year of plenty. Only rarely in this respect has the country been more greatly favored."

Radio Code to Japan Barred

THE Japanese Government has forbidden the use of code in radio as well as cable messages sent to Japan during the present emergency. The Radio Corporation of America was notified that on orders from Tokio no messages would be received at the Japanese Government radio station at Iwaki, Japan, which were written in any language other than plain English or Japanese.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

Clarence Thompson, 53 Appleton City, Missouri.
C. R. Crawford, 1006 Pender Street West, Vancouver, B. C., Canada.
L. F. Hewlett, 8713 Colonial Road, Brooklyn, N. Y.
Maybrook Radio Supply, Maybrook, N. Y. (Dealer.)
Latto Radio Service, 1937 Reid Avenue, Lorain, Ohio.
Chester Wilson, 3306 Freeman Avenue, Kansas City, Kansas.
Chas. F. Bomer, 8703 139th Street, Jamaica, N. Y.
J. S. Hagans, Box 447, Chicago, Ill.
Beardslee Radio Laboratory, 125 Scott Street, Wheaton, Ill. (Retailers.)
F. W. Kerchner, M. D., Glen Carbon, Ill.
J. D. Oakes, Flotonia, Texas.
Ray O. Townsend, Box 91, Cape Charles, Va.
H. V. Montgomery, 1715 Glendale Avenue, Detroit, Mich.
Elmer E. Martin, North Lima, Ohio.
C. A. Robinson, 917 Seventh Street, Charleston, W. Va.
John H. Allen, 1002 West Street, Wilmington, Del.
Robert S. Cook, 1426 Asbury Avenue, Evanston, Ill.
B. Weiss, 96 Watkins Street, Brooklyn, N. Y.
Wm. E. Thompson, R No. 1, Box 34, Barron, Wisconsin.
J. F. Totten, Jr., 830 Stanbridge Street, Norristown, Pa.
Robert H. Walters, R. 1, Box 40, Glidden, Iowa.
Frank Maguire, 130 Hamilton St., Cambridge, Mass.
D. J. Elliott, 161 Penna. Ave., Wilson, Pa.

Radio Trade Notes

A discharge in bankruptcy has been granted to Beatrice K. Owen, who was a partner in the Beacon Radio & Electric Co., at 246 Greenwich Street, New York City.

* * *

A petition in bankruptcy has been filed against the Electrical Corporation of America, manufacturer of radio parts, 428 Broadway, New York City, by August Heusel for $275, Holmes & Rice $338, Whitman Advertisers' Service, Inc., $192. Richard Campbell was appointed receiver under $5,000 bond by Judge Manton. Liabilities about $36,000; assets about $20,000.

* * *

Bankruptcy proceedings have been instituted against the Witherbee Storage Battery Co., Inc., 234 West 55th Street, New York City, by Eagle-Pitcher Lead Co., for $1,500, Broadway Tire Jobbers, Inc., $100, Graselli Chemical Co. $800, Dorothy Spero $18.

* * *

Elmer E. Martin, North Lima, Ohio, plans to sell sets and parts to the rural population in his vicinity.

* * *

The Fullerton Electric Co., 230 West Seventeenth street, New York City, has had confirmed a composition with its creditors on a 50 per cent. basis.

* * *

Wm. C. Shackett has obtained a judgment for $173.39 against the Continental Radio & Electric Corporation of New York City.

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Andrea Welcomes Patent Suit by Radio Corporation of America

UNDER the caption "Keeping in Style" F. A. D. Andrea, Inc., 1581 Jerome Ave., New York City, sends the following communication to RADIO WORLD:

"Early this year our friend and worthy competitor, A. H. Grebe & Co., announced 'A New Spring Suit,' bearing reference to litigation instigated by the Radio Corporation of America.

"We take pleasure in advising the trade that within the past few days 'A New Fall Suit' has been filed by the Radio Corporation of America against F. A. D. Andrea, Inc., the substance of which is alleged infringement of the Rice & Hartley patents Nos. 1334118 and 1183875, respectively, through the manufacture and sale of radio receivers embodying the Hazeltine Neutrodyne circuit, in accordance with the patents and pending applications of Hazeltine.

"This action is most welcome as it affords opportunity for early adjudication of the validity and scope of the Rice & Hartley patents and the alleged infringement of these patents by apparatus manufactured and sold under the Hazeltine patents and pending application.

"This 'New Fall Suit' will be defended by F. A. D. Andrea, Inc., with the cooperation and support of the Independent Radio Manufacturers, Inc., of which organization F. A. D. Andrea, Inc., is a member.

"The Independent Radio Manufacturers, Inc., is a group of radio manufacturing companies who are prominent factors in the radio industry and whose interests are pooled as regards the use of certain patented inventions and the prosecution and defense thereof.

"The trade will no doubt recall the work of this organization last year in connection with the crystal patent litigation, instituted by the Radio Corporation's associate, the Wireless Specialty Apparatus Company, and the commendable action taken by the organization, both as regards the defense and the prosecution of its rights in this situation.

"The Independent Radio Manufacturers, Inc., are represented in patent matters by the firm of Penny, Davis, Marvin & Edmonds. They advise that there is a good and valid defense to the suit started by the Radio Corporation of America on the Rice & Hartley patents.

"From our legal advice we are lead to the independent and firm belief that the defense of our 'New Fall Suit' will result in absolutely no change in our activities in connection with the Hazeltine Neutrodyne receivers, and therefore both at present and in the future the manufacture and sale of this receiver will continue unabated.

Very truly yours,
F. A. D. ANDREA, INC.

Kansas Telephone Company Gives Radio Broadcast

THERE are ever and anon new ideas popping up in some quarter or other, be it radio or telephone or the pruning of hedges. The latest radio wrinkle that has proved to be of a real service was tried out by J. A. Gustafson, manager of the Fredonia Telephone Co., Fredonia, Kansas.

Being a radio enthusiast he thought he could make the telephones serve some other purpose than the regular line work. He therefore hooked up a power amplifier to the regular lines, and informed the subscribers that for the nominal sum of one dollar a month he would furnish them with radio programs over the telephone. He does not furnish loud speakers, but he furnishes the programs, which he picks up "in the air" and relays over the land lines. The programs start early in the morning with the market and crop reports and continue all day long, time signals, and dance music being given. A lot depends upon Mr. Gustafson's ability to satisfy the multitude, so he must pick out the programs that he thinks will please the entire list.

It might be of interest to state that there are 75 installations made to date, and that none of them interferes with the regulation traffic of ordinary everyday telephoning.

Compact Loop Antenna

A NEW form of loop antenna, or more properly compact folding loop antenna, has been devised by the Rocky Mountain Radio Company, 9 Church street, New York City. Instead of using many consecutive turns of wire this new antenna consists of a spiral spring which is really 80 feet long, but due to its construction, the loop itself is simply one turn of this spring.

The loop can be erected or taken down in 30 seconds, due to its peculiar construction, and when folded, occupies an exceedingly small space. The present construction as regards the spiral wire has been tested and found to equal any of the other form of loops of the solenoid variety, which take up quite a bit of space even when made in the portable form.

Radio Birthday Party

VAUGHN DE LEATH has extended a special invitation to all Station WDT fans to listen in to a special birthday program which will be broadcast from that station on September 26th.

There are many novelties and exceptionally fine numbers to be provided for the occasion.

The hour is an early one—seven to eight p. m. In fact, Vaughn says she does not think many people know about that early hour on Wednesday night. But she hopes everyone will be listening in on September 26th to attend her birthday party.

New Radio and Electrical Firms

Ajax Electric Hammer Corporation, New York City, tools, $100,000; S. B. Howard, R. K. Thistle, H. C. Hurd. (Attorney, S. Ryan, Albany.)

* * *

Leff Electrical Co., Brooklyn, N. Y., $20,000; D. Leff, H. Albert. (Attorney, J. H. Leff, 499 Hart St., Brooklyn.)

* * *

Post Radio and Electric Corp., New York City, $10,000; M. Silberman, S. Modell, S. S. Lef. (Attorney, S. B. Leff, 200 Fifth Ave.)

* * *

Bensal-Bonis Co., New York City, to make radio devices, $10,000; H. Bonis, D. Bensal, M. Hetterich. (Attorneys, Goodman & Werner, 51 Chambers St.)

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ALL RADIO DEALERS.

Type "A"—1 Amp., 75 ohms.....$1.80
5 Amp., 30 O. (4 or more tubes).. 2.25
Type "B" for "B" Battery..... 1.80

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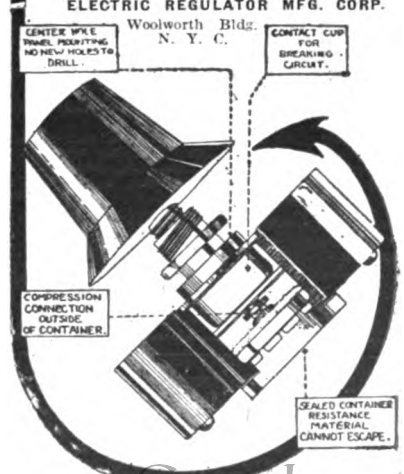
ELECTRIC REGULATOR MFG. CORP.
Woolworth Bldg. N. Y. C.


CENTER HOLE PANEL MOUNTING NO NEW HOLES TO DRILL.
CONTACT CUP FOR BREAKING CIRCUIT.
COMPRESSION CONNECTION OUTSIDE OF CONTAINER.
SEALED CONTAINER RESISTANCE MATERIAL CANNOT ESCAPE.

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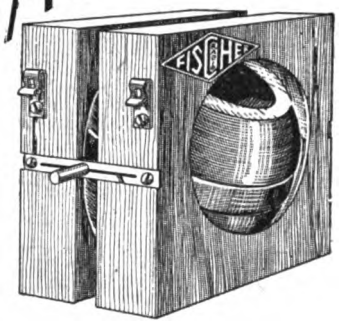

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Coils are fully assembled, made exactly as specified by Mr. Cockaday, D coil bank wound. Far more efficient than any home made coils.

Standard parts for this sensational circuit—panel, coils, condensers, verniers, variable resistance, vernier rheostat, socket, double jack, dials, switch, contact points, posts, busbar, wire, spaghetti, etc. (no tubes or phones).

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Radio Canoeists on Portage Lakes Hear Fight Returns

AKRON, Ohio.—Radio equipped canoes have become an essential part of the duffle of the modern camper, according to two local amateurs, who, while experimenting with a portable set on the Portage Lakes, heard fight returns from Eastern broadcast stations and amateur transmitters as far away as Philadelphia and Chicago. D. A. Hoffman, of the American Radio League and operator of the amateur station 8UX, and Fred Ash agree that radio installation on canoes is entirely practical.

A compact home-made single regenerative receiver, using a detector and one stage audio amplification with C299 tubes, was available. This set, with a motorcycle storage battery and the necessary B batteries, was placed on the bottom of the canoe. Two six-foot bamboo poles were stuck in the flag sockets at each end and a spiral aerial, consisting of 150 feet of insulated fixture wire, was looped between the two poles on a piece of clothesline.

The ground consisted of a ten-foot piece of bare wire which was connected to the set at one end and dropped overboard.

Each of the two experimenters wore a headset and the first station copied was 9AJA, Chicago. Other amateurs heard were 9EKU, Devil's Lake, North Dakota; 9EKF, St. Louis, Mo.; 8DGX, Pittsburgh, Pa.; 8OK, Lewisburg, W. Va.; 8SF, Sharpsburgh, Pa., and 9AWK, Elgin, Ill. All but two of these were CW stations and came in with good intensity.

Fight returns from KDKA and concerts from WLW were also heard plainly. Other canoeists who witnessed the experiments were envious. Hoffman says he will make other experiments with a transmitter in an effort to establish two-way communication with amateur stations within 100 miles of his canoe. The stunt of transmitting from such a small craft presents a big problem, but it is just such problems that the amateur fraternity are always eager to solve.

Station WBZ Broadcasts City Chimes

ONE of the new features on WBZ's interesting and varied program is the broadcasting of the chimes located in the lofty "Campanile," the Madison Square Tower of Springfield, Mass. These chimes, which can be heard for miles round the country, are broadcast every Sunday night before church services at 7:30 p. m.

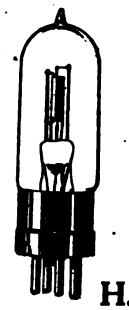
The selections open with the playing of "America," and end with "Taps." Because of their great beauty and variety, it is possible to play many fine musical numbers and selections. Several tests have demonstrated the beauty of music from chimes, which is particularly adapted to radio broadcasting.

It is an interesting and unusual fact that listeners at their radio receiving sets located thousands of miles away receive the music from the chimes several seconds before the strollers in the municipal park near the Campanile or by the men in the fields about the city. It takes actually less time for the electric impulses carrying the music to make the journey over the wires to the Westinghouse broadcasting plant in East Springfield, and to send them broadcast for thousands of miles, than it does for the sound waves themselves to reach the ears of the listeners in the park, several hundred feet below. In fact, the radio waves could circle the earth seven times before the sound could go 1,000 feet.

This is due to the fact that sound waves travel much slower than radio waves, which cover a thousand miles in one one-hundred-and-sixty-sixth of a second.

Proposed Broadcasting in Southern France

AN attempt is being made by local business men in Marseilles, France, to establish a broadcasting station in collaboration with the newspapers of the city. A local dealer in French-made sets is said to be the prime mover in the project.



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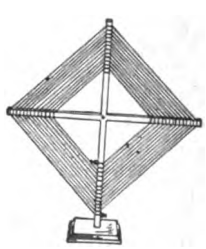

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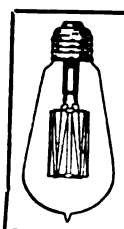

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TELEPHONE, LACKAWANNA 6976

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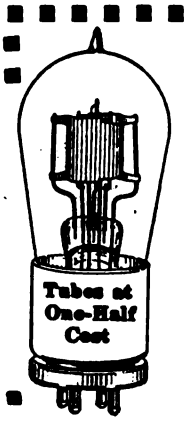

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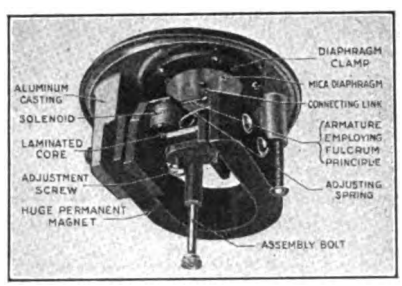

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EDITOR, RADIO WORLD:

Referring to my letter in your number of September 8th, I regret extremely to have to ask you to correct two errors.

I stated that I could not get broadcast stations with my four-tube crystal detector reflex receiving on my single wire antenna, 250 feet long (50 feet high). This was due to B battery trouble. I am now getting as good reception of broadcast stations as could be asked for on the above antenna on a three-tube regenerative circuit, a six-tube radio-frequency circuit, and a four-tube and crystal detector reflex circuit and a five-tube neutrodyne circuit.

I might add that this is my first experience with the neutrodyne circuit and I find it wonderfully satisfactory. It tunes very sharply and is the most powerful of all my circuits above mentioned.

The other mistake was to put a period in the wrong place, making it appear that I could get the shortest amateur stations better on a short 100-foot single antenna (30 feet high) than on the 250-foot antenna at Seal Harbor, Maine, which antenna is also 30 feet high. As a matter of fact and greatly to my surprise, I got 200 meters and below very much better on the 250-foot single wire antenna than on the 100-foot antenna.

My experience would lead me in putting up a new antenna to make it as high and as long as conditions would permit and if more convenient to use plain copper wire rather than multiple strand, I would not hesitate to do so. As far as I can see the reception on one is as good as on the other.

In conclusion, I would repeat—make your antenna as long as you can and as high as you can. Yours very truly,

160 State Street, W. K. SHAW.
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JONESY: "Say, Bill, what do you enjoy most on your radio?"

Bill: "Well, when the wife is in I have to enjoy opera selections or fashion talks. When daughter has a caller it is generally ballads or jazz. When son is around, he goes DXing. So I generally enjoy what I get—like ordering hash in a restaurant."

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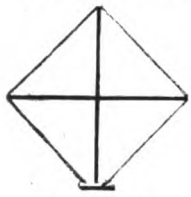
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Equipped with FAHNESTOCK PATENT Wire Connectors Easily Attached
No Soldering—For Radio Use Only
AT YOUR DEALERS
FAHNESTOCK ELEC. CO.
LONG ISLAND CITY, N. Y.

Don't Ask for Rheostat—Say
FIL-KO-STAT
FOR REAL FILAMENT CONTROL

Look These Specials Over!
Murdock 3000 Ohm Phones..... $4.45
43 Plate Precision Condenser..... 2.25
Jefferson Transformer A. F..... 3.45
Sent C. O. D.—Pay the Postman
CENTRAL RADIO SUPPLY CO.
44 West 117th Street New York City

Arctic Trading Posts Enjoy American Radio Concerts

THOUGH ice-bound and in darkness through the long winter months, trading posts in the Arctic zone will not be entirely isolated from civilization and life. According to plans made by the Hudson's Bay Company, lonely posts will be provided with radio receiving sets so as to secure entertainment at any time. Two north-bound ships, the S.S. "Bayeskimo" and the S.S. "Nascopie" are carrying Westinghouse radio receiving sets to six of the posts above the Arctic Circle.

In order to determine whether or not these posts will be able to hear the concerts from the United States next winter, the ships are listening in on their way north to the broadcasts as they steam to the frigid zone. Several nights ago, the Westinghouse Station WBZ in Springfield, Mass., gave a special concert at 11 p. m. and radiograms received from the steamship "Bayeskimo" state that the music has been heard with great success.

There are hundreds of posts spread throughout Canada and North America, from above the Arctic Circle into James Bay. The ships have left for these trading posts and the factors will have their sets for next winter. Although the reports received so far from the ships are very encouraging, complete information on the results secured will be obtained upon their return. The posts are so far removed from civilization that this will be the last news from the outposts until spring. The lanes of travel to these posts are entirely blocked on account of the heavy ice which accumulates.

WBZ Fans to Compete for Short Story Prizes

PERSONS who like to write, or who want to learn how, will welcome the announcement from Station WBZ that a course in short story writing will be broadcast at regular intervals.

Dr. J. Berg Esenwein, probably the best known national authority on short story writing, has been chosen by Station WBZ to give the course. Every Thursday evening, at the same hour, and continuing for ten weeks, Dr. Esenwein will give ten separate and complete lectures on the elements of writing, development of plots, climaxes, treatment, etc., which will cover the subject in a most thorough manner.

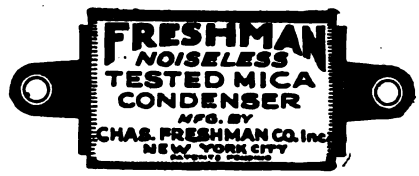
At the conclusion of the course, any person who has been listening to the series of lectures will be eligible to enter the contest of short story writing, for which a first prize of $25, a second and third prize of $15 and $10 respectively will be awarded. Dr. Esenwein will outline briefly, at the beginning of the course the conditions for the contest and fans will listen in carefully, as the stories will have to be written so as to show that the course has been followed.

The introduction of this feature in the program of the Westinghouse station at Springfield, Mass., is an innovation in broadcasting. It is the belief of the station that such a course will accomplish more to justify broadcasting that the miscellaneous talks which have been so current at most stations. The outcome of this experiment is to be watched with interest.

Lakes Radio Bulletins

WEATHER bulletins and hydrographic information will be broadcast twice daily by the Intercity Radio Company, located in Cleveland, on Lake Erie. The service is intended for the shipping on the Great Lakes, and will be broadcast on a wave length of 706 meters, spark. The call of the station is WTK. This station also is licensed to communicate with Rogers City, Mich., on a wave of 1,764 meters.

The Condenser Sensation of Modern Radio



Through the accuracy and dependability of Freshman Condensers, hook-ups and circuits have been perfected which have completely revolutionized the art of Radio Reception.

These little Storers of energy and rectifiers of Radio Current are the very heart of a well-built radio set.

The proper fixed condenser will make all the difference in the world in the reception, clarity and selectivity your set affords.

Capacity	Each	Capacity	Each
.0001	$ .35	.002	$ .40
.00015	.35	.0025	.50
.00015	.35	.003	.60
.0002	.35	.004	.75
.0002	.35	.005	.75
.00015	.35	.006	.75
.0025	.35	.006	1.00
.0006	.40	.01	1.00
.0006	.40	.015	1.50
.001	.40	.02	2.00
.0015	.40	.025	2.50

The FRESHMAN is so designed that constant equal pressure is exerted on the condenser plates over the entire area. They are the only condensers that do this and therefore the only condensers that avoid noises, which are due to variable pressure on the plates.

At your dealers, otherwise send purchase price and you will be supplied postpaid.

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Radio Condenser Products
100 SEVENTH AVENUE., NEW YORK

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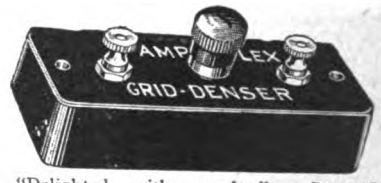
GRID-DENSER
A Variable Condenser (.0005) for the Grid Circuit.


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"Have an excellent set, but failed to get long distance. Placed 'Grid-Denser' in and have picked up 1,000 miles."—Chas. F. Smisor, Editor, Radio Digest.
Approved and recommended by Radio Laboratories of Radio News, Radio World, New York Mail and other experts.
DOUBLES the efficiency of your set.
Greater distance
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At your dealers—otherwise send price and Grid-Denser will be sent immediately.
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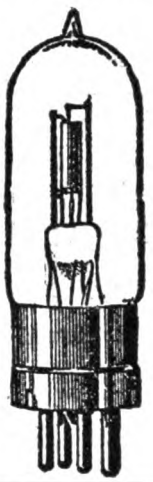
To the DX Nite Owls

and anyone else interested in radio! If you missed RADIO WORLD, dated Feb. 24, with the famous Flewelling Circuit, get it now and get your EARS WET! Send 15c or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York.

Radio Tubes Repaired



Send in Your Broken Down, Burnt Out Tubes

$1.50 AND UP

We Repair and Guarantee Them to Function Equal to New.

Mail Orders Promptly Attended to

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WD-11 and WD-12
TUBES REPAIRED

WD-11 or WD-12	$3.50
C-300 or UV-200	2.75
C-301 or UV-201	3.00
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NEW DX 1½ VOLT TUBES $4.00

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TUBES SENT PARCEL POST, C. O. D.

ON APPROVAL FOR 30 ¢
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Standard of the Radio World, 190 separate units, each fully Guaranteed.
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DO YOU WANT PLANS FOR MAKING THE SLEEPER DUOTOL RECEIVER, USING THE SLEEPER TWINS, —Two Variometers and the fixed Coupler? SEND 10c for the June issue of RADIO AND MODEL ENGINEERING.

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FREE INVENTION RECORDING BLANK
Phone Vanderbilt 7912

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YOU CW BOYS!

Do You Want to Change Your Transmitter or Are You Planning to Build One?

Then you will want these back numbers of Radio World: March 31, A Low Power CW Transmitter, by C. White. April 21, Hams Transmitter, by John Kent (circuit used by 2YE). May 5, Combined CW and Phone Set of M. Bobart, at Radio Central. May 26, A Simple CW or Phone Set That Works. E. W. H. Decker, 2UA. These numbers describe in detail all the various parts, with complete instructions as to how to operate. No up to date amateur should be without them. 15c. a copy. The four copies for 60c. or start your subscription with any number.

Salesmanship Behind the Counter

WHAT does it matter if the manufacturer produces the best goods in the world, if he advertises them under a trademarked name so consistently that they are known from coast to coast, if he puts them on the shelves of practically all the retailers; the spiders will merrily spin webs around them if they are not sold by the retailer—the ultimate salesman. That's why economists, researchers, and investigators on the trail of "cost of distribution" have followed the goods of the world into the retail store and have told the retailer—that is, the average retailer—that his turnover is too low, says Arthur W. Little in "Forbes" Magazine.

In scores of smaller stores in America and particularly in the more progressive smaller retail establishments in the Middle and Far West, the investigator finds little classes in salesmanship established by the proprietors and conducted by methods similar to the training methods of the metropolitan stores. Sales forces assemble in the stores in the evenings and study merchandise analysis and stage mock sales.

Often these evening sessions are addressed by the traveling salesmen of concerns from whom the stores buy goods. Manufacturers and wholesalers whose products are marketed by retail stores are training their salesmen in all branches of retail merchandising; these road men often are former retail salesmen; they know how to sell and they go out into their territories with orders from headquarters to impart their knowledge of salesmanship to their customers.

In Lawrence, Kansas, is the store of a retail clothier who, among clothiers everywhere, is considered a big-league merchandiser.

"Listen" this man confided to me, "the best source in the world for selling ammunition is the traveling salesman. Me? I never buy a bill of goods that I don't demand, along with the goods, enough information about them to sell them. When I put in a new line, I kidnap the salesman. Then I call my own men together and say to them, 'Boys, this fellow here just sold me some goods, and he gave me a danged good selling talk about them. Now I'm going to ask him to repeat that talk to you. I want you to make notes and ask questions; so that when the goods come in, you can sell them.'"

Radio Penetrates Grand Canyon

THE Geological Survey party carrying a radio set on a trip through the Grand Canyon of the Colorado, has arrived safely at Bright Angel trail. Notwithstanding the predictions of experts that it would be impossible to receive radio messages while in the bottom of Grand Canyon, Colonel Birdseye reports that he is in daily receipt of messages broadcast from Los Angeles, Salt Lake and Chicago. He received the news of President Harding's death within 45 minutes after it occurred. Reports of his progress will be sent out for broadcasting when he reached Basstrail about September 10, Supai Creek September 20 and Diamond Creek October 15.

TELEPHONE NUMBER CHANGED

The telephone number of RADIO WORLD has been changed to LACKAWANNA 6076

PROTECT
THE HEART OF YOUR RADIO SET

Vacuum Tubes are costly and extremely delicate. B battery or any other excessive current applied for only the fraction of a second to the filament leads will burn out your tubes.
You have probably already had this experience and it is apt to happen again at any time.
A burnt out tube means money lost—the set out of commission — inconvenience to you.

Why Take These Chances When RADECO SAFETY FUSES

will absolutely protect your tubes. Applied in an instant to the filament terminals. Will fit any standard tube or go in any standard socket. Fully guaranteed. **50 cts. each. Sent Postpaid.** Delay may be costly. Write now. Specify type of tube used.

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Radio Equipment Company
630 Washington Street Boston, Mass.
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Distributors of many other successful Radio Specialties. Dealers:—Write for our proposition and full details.

THE ORIGINAL PEANUT TUBE
WELSH PEANUT TUBE
W. T. 501
Resembles a peanut in size and shape.
A Sensation Last Season—
A Real Business Getter This Year

LOWER COST ▽ BETTER RESULTS

List Price $2.00 ▽ Sockets ....40c Adaptors ..75c

Operates either on storage battery or three dry cells. Sent by parcel post prepaid on receipt of price if your dealer has not stocked them.

WELSH ELECTRIC LAMP CORP.
69 BOYLAN STREET NEWARK, N. J.
BEWARE OF IMITATIONS

VACUUM TUBES REPAIRED
WD11—WD12—UV201A—UV199—and others for
— $3.00 —

Quick service—All tubes repaired by us guaranteed to work as good as new. Send your dead tubes—we prepay parcel post to you. All you pay is $3.00 to postman. We give 48-hour service.

Thomas Brown Co.
511-517 Orange St. Newark, N. J.
Write Plainly

SEND NO MONEY
Guaranteed!
$3.98
Money back if they do not satisfy after
5 DAYS TRIAL
SEND no money! Order by postcard and pay postman on arrival. If they do not excel any other phones you ever used regardless of price, return them and your money will be refunded at once.
GUARANTEED ONE YEAR
AMBASSADOR
LONG RANGE PHONES
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State Your Radio Wants in Radio World's Classified Dept.
Five Cents a Word, Ten Words Minimum.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio and other fields. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get an eight-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands eight days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office eight days before publication. RADIO WORLD, 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

SAVE $20.00—Our unwired regenerative receiver contains the best of material mounted on panel in handsome oak cabinet. Value that will surprise you, and the price is only $14.00, prepaid. C. E. Janson, 28 Bellevue St., Lowell, Mass.

STOP EXPERIMENTING—GET RESULTS with circuit used in leading WD11 tube set on market. Paragon of simplicity in design and construction. Circuit and specifications, 50c. OKAYED SUPPLIES CO., ELWOOD, IND.

FRENCH COLONIES FREE—Beautiful picture set, including Native Chiefs, Tigers, Pictorials; 2c postage. Empire Stamp Company, 351 Lippincott St., Toronto, Canada.

WESTINGHOUSE R. C. 3 tube set, like new, for sale cheap. O. Lyshang, 6 Althea St., Dorchester, Mass.

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

SECOND-HAND Westinghouse R. C. Regenerative receiver, consisting of detector and two-step amplifier, $65.00. Three Erla Radio Frequency Transformers, $6.00; Crosley two-step amplifier, $14.00. All of the above is good as new and will work with all standard bulbs. Address Randolph Whitehand, Albany, Georgia.

EVERY RADIO FAN should have these two books, "101 Receiving Circuits" and "Six Successful Receiving Sets." By M. B. Sleeper. They are the most up-to-date radio books for the fan who likes to make his own, and will help you out and save you many times their cost. Both books are full of illustrations. Price, 50c. each, with 10c. extra for postage, or both for $1.00 sent postpaid. COLUMBIA PRINT, 1493 Broadway, New York City.

SUPER-SIMPLICITY CIRCUIT—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, tape or radio frequency. Nothing to guess about. Complete hook-up and particulars, $1.00. No checks. Build your own. Save 50% and get better results. RADIO EXPERIMENTAL LABORATORY, Box 194A, Berkeley, Calif.

CHEAPEST TO BUILD—Easiest to tune. Get particulars Rokay Single Control Hook-up. Describe your set. Rokay Electric Company, Ingomar, Ohio.

MOTORCYCLES AND SIDECARS—Their Construction, Management and Repair.—By Victor W. Pagé. Describes fully all leading types of machines, their design, construction, maintenance, operation and repair. Shows all new improvements in motorcycle construction and gives the most complete instructions ever published for starting, driving and repairing all types of motorcycles. There is a complete exposition of modern starting methods and a full explanation of the operating principles and repair of the new automatic electric lighting systems. The care of the generator, storage battery, automatic cut-out and other parts is clearly expounded. All types of change speed gears and clutches are fully outlined, also full instructions for their use. A complete new chapter has been added on the thorough overhauling and repairing of motorcycle engines, all processes are fully described and illustrated. The reader is told what parts wear, how to detect depreciation and how to make all repairs and adjustments necessary to make the engine as good as new. 693 pages, 371 illustrations. New Revised and Enlarged Edition. **Price, $3.00.** THE COLUMBIA PRINT, 1493 Broadway, New York City.

WANTED—Paragon RA-10 Receiver and DA-2 Amplifier. State best offer. Ted Boston, Marion, Ky.

SACRIFICE! Three-circuit tuner, detector, three-step audio. In cabinet. Gets both coasts. $75. Seller attending college. ROBERT RALSTON, Tarkio, Missouri.

15c. LETTERED BINDING POSTS, complete set eight, 60c; two sets, $1.00. Prepaid, same day. Stamps accepted. Everything in radio. Ask for quotations. List for stamp. Kladag Radio Laboratories, Kent, Ohio.

GET OUR PRICES on Plate and Filament Heating Transformers. L. Werts, 409 St. Julian St., Pekin, Ill.

FOR SALE—De Forest Portable Radiophone Transmitter. 5-watt bulbs; new, $100 net F. O. B. P. O. Box 33, Red Bank, N. J.

60,000 MILES ON A HOME-MADE RECEIVER. With a 2,600-mile range. 100 station log and hook-up for the asking. Send addressed envelope. Maitland Roach, 2905 Columbia Ave., Philadelphia, Pa.

RADIO SET—Extremely sensitive tuner and one step in 8x18 walnut cabinet. I hear Kansas City Star; Omaha, Neb., etc. Atwater Kent parts. Complete with two WD11 tubes and phones, $70 postpaid. Address, Garth Showers, Tannersville, N. Y.

DETECTIVES NEEDED EVERYWHERE—Work home or travel. Experience unnecessary. Write, American Detective System, 1968A Broadway, N. Y.

WIRING A HOUSE. By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. COLUMBIA PRINT, 1493 Broadway, N. Y. C. Price, 35 cents.

WOULD YOU LIKE TO RECEIVE RADIO LITERATURE? Are you in the market for radio goods of any kind, either as a consumer, a distributor or a retailer? If so, send us your name and address on a post card and we will see that your name reaches the right people so that you will receive pamphlets, circulars, etc., regarding the goods you want. Address SERVICE EDITOR, RADIO WORLD, 1493 Broadway, New York City.

RAND-McNALLY RADIO MAP OF UNITED STATES—Is 28 x 30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover. Price, 35c. The Columbia Print, 1493 Broadway.

THE MODEL T FORD CAR—Its Construction, Operation and Repair, Including the Fordson Farm Tractor, F. A. Lighting and Starting System, Ford Motor Truck.—By Victor W. Pagé. This is the most complete and practical instruction book ever published on the Ford car and Fordson tractor. All parts of the Ford Model T car and Fordson tractor are described and illustrated in a comprehensive manner. The construction is fully treated and operating principle made clear to everyone. Complete instructions for driving and repairing are given. To the New Revised Edition matter has been added on the Ford Truck and Tractor Conversion Sets and Genuine Fordson Tractor. All parts are described. All repair processes illustrated and fully explained. Written so all can understand—no theory, no guesswork. New revised and enlarged Edition just published. 153 illustrations, 410 pages, 2 large folding plates. **Price, $2.00.** THE COLUMBIA PRINT, 1493 Broadway, New York City.

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FOR SALE—Three Radio Corporation, 200 to 5000 meter radio frequency transformers, like new, fine for superhetroydne, $5.00 each. Fine Phonograph attachments, needle operating kind. Guaranteed good as Magnavox, $10.00 each. Any of above sent post paid, collect, on receipt of $1.00. Everything sold on money-back guarantee. RAYMOND MOORE, Box 404, Lakeside, Ohio.

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ALL ESSENTIAL PARTS FOR building Neutrodyne Receiver, complete instructions, etc., $21.50 C. O. D. Reinartz tuning coils, $1.30. R. Schwartz, Buchanan, Mich.

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150 FUNNY PARODIES on latest songs, 25c. Book catalog, 2c. R. W. Collins Co., 197 Fulton St., Brooklyn, N. Y.

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20,000 GERMAN marks, $1; 10,000 Austrian crowns, $1; 1,000,000 Russian rubles, $1. All 3 for $2. AMERICAN SALES CO., Box 1278, San Francisco, Calif.

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1 At four dollars an inch (yearly contract rate) 74,000 radio-buying readers learn of your goods—a greater number of eyes than four dollars can reach in any other radio advertising medium.

2 Radio World gives **quicker results**—i. e., advertising copy received by Thursday p. m. is published and on the news-stands the following Wednesday morning.

3 A Weekly has greater **reader interest**—the Saturday Evening Post, Literary Digest, Iron Age, are Weeklies. Radio World, the big success of radio, is published every week.

4 Advertising is a gamble. Life itself is. A gambler bets his money on past performances. Radio Corporation of America tried out **Radio World,** then gave us a yearly contract. Magnavox tried us for small space thirteen times, and have just renewed for fifty-two times, using pages. The Federal Telephone & Telegraph Company investigated us from every angle for weeks, then gave us a fifty-two consecutive issue order. A four-time trial of Radio World almost invariably ends with a fifty-two time contract at $120 per page net or $4.00 an inch.

DIAGRAMS AND DESCRIPTIVE MATTER ABOUT THE LATEST ARMSTRONG, FLEWELLING, REINARTZ AND OTHER FAMOUS CIRCUITS, together with other special features, will make **Radio World's** FALL BUYERS' NUMBER a great cash producer for advertisers.

DATE OF THIS IMPORTANT ISSUE—OCTOBER 6

(LAST BLACK FORM CLOSES SEPTEMBER 27)

Special service and value to advertisers in Radio World's **FALL BUYERS' NUMBER:** All advertisers who give us copy for quarter page or more space in Radio World's **FALL BUYERS' NUMBER** will, on request, have their announcements appear in **two colors at the price of one**—in case copy is in our hands by September 24.

Write, wire or phone now for special positions

RADIO WORLD, 1493 BROADWAY, NEW YORK CITY

TELEPHONE LACKAWANNA 6976

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Sleeper's Two Latest Radio Books

Two new and remarkably good radio books by M. B. Sleeper —one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a regenerative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for $1.00 and no extra charge for postage. The Columbia Print, 1493 Broadway, New York City.

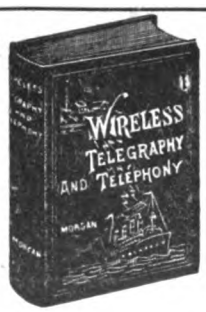
SPECIAL OFFER
TO NEW RADIO WORLD SUBSCRIBERS:

Send $6.00 for yearly subscription for Radio World (52 numbers) and these two Sleeper Radio Books will be sent you free, parcel post prepaid. This offer good only until October 1, 1923. If you are already a subscriber, send $6.00 NOW for a renewal and books will be sent you.

IF YOU ARE INTERESTED IN RADIO YOU NEED THESE BOOKS

Radio Books for Your Vacation

Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems



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By ALFRED P. MORGAN

One of the most complete and comprehensive treatises on the subject ever published. A study of its pages will enable one to master all the details of the wireless transmission of messages. The author explains in simple language the theory and practice of wireless telegraphy and telephony. 154 pages, 156 engravings.....PRICE $1.50

The A B C of Vacuum Tubes Used in Radio Reception

By E. H. LEWIS

Assoc. I. R. E., and Radio Instructor

Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated.....PRICE $1.00

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